# PESTICIDES ABSTRACTS

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**U.S. ENVIRONMENTAL PROTECTION AGENCY**

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*PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.*

*The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.*

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**77-1371.** Cramer, H. H. (Biol. Inst., Bayer AG, Leverkusen, Germany). **Herbizide im Spannungsfeld zwischen Oekologie und Oekonomie. [Herbicides in the no-man's land between ecology and economy.]** *Naturwiss. Rundsch.* 30(3): 101-102; 1977. (German)

From time immemorial agriculture has resembled a war between crops and weeds. The introduction of chemical herbicides, along with systematic plant breeding and mechanization, have greatly reduced the labor requirements of agriculture. Herbicides are used on more than two thirds of the cultivated land in Germany today. The selective action of the hormonal herbicides on broad-leaved weeds led to an increase in weed grasses. Elimination of weeds by herbicides resulted in elimination of host plants for parasitic insects, and thus in an increase in pests such as aphids. The intensification of nutrient supply also increased the danger of plant diseases. The soil microflora largely adapts itself to the herbicide treatment employed. Herbicides will be increasingly required to meet the food demands in developing countries.

**77-1372.** Cociasu, C. (Author address not given). **Consfatuirea interjudeteana "Probleme ridicate de poluarea mediului prin pesticide si fertilizante." [Joint meeting on "problems of environmental pollution by pesticides and fertilizers."]** *Rev. Chim. (Bucharest)* 28(2): 192; 1977.

Problems of environmental pollution by pesticides were discussed at a joint meeting of agencies dealing with agriculture, public health, and environmental protection in Romania. Instances of damage to workers' health were presented as well as other accidental poisoning cases. New, non-polluting pesticides were described, as were methods of preventing pollution during pesticide manufacture. Pesticidal pollution of groundwater, crops, animal products, and human tissue were described in various reports. Strict attention to the reduction of pesticide emissions into the environment is counseled.

**77-1373.** Misato, T. (Inst. Phys. Chem. Res., Wako-Shi, Saitama 351, Japan). **The development of agricultural antibiotics.** *ACS Symp. Ser.* 37: 170-192; 1977. (84 references)

The development and status of agricultural antibiotics were described. The agricultural applicability of antibiotics was examined in a large series of screening tests, based on efficacy, safety, and cost considerations. The principal agricultural antibiotics used in Japan are cycloheximide, griseofulvin, blasticidin S, kasugamycin, polyoxins, ezomycin, validamycin, streptomycin, cellocidin, chloramphenicol, basic copper, novobiocin, and tetranactin; the last-mentioned is an insecticidal antibiotic. Kasugamycin, validacin, and blasticidin S are used in largest quantities. Advantages of agricultural antibiotics include selectivity, biodegradability, and low fossil fuel consumption for production. Disadvantages are the difficulty of analysis, development of resistance, and possibility of adverse public health effects. Studies on antibacterial and antifungal antibiotics are continuing, and the potential use of herbicidal and antiviral antibiotics is being tested.

**77-1374.** Brooks, G. T. (Agric. Res. Council, Unit Invertebrate Chem. Physiol., Univ. Sussex, Brighton, BN1 9QJ, England). **Chlorinated insecticides: retrospect and prospect.** *ACS Symp. Ser.* 37: 1-20; 1977. (70 references)

The history and characteristics of the organochlorine insecticides are surveyed. The environmental controversies of the past fifteen years have resulted in accumulation of large amounts of information about the environmental toxicology of chlorinated insecticides, with implications for the environmental transfer of other xenobiotics. The annual global use of DDT for disease vector control amounts to about 40,000 tons at present and is expected to remain constant for the next decade. The future of chlorinated insecticides will depend on the possibility of developing less persistent and perhaps less highly chlorinated insecticides.

**77-1375.** Environ. Protect. Ag. (Washington, DC). **Federal Assistance programs of the Environmental Protection Agency.** *Natl. Tech. Inform. Serv.* PB-254,631, 1975, 71 p.

This publication includes descriptive information about the Environmental Protection Agency assistance programs reprinted from the Catalog of Federal Domestic Assistance, which was prepared for the Office of Management and Budget in April 1975 and has a publication on date of June 1975. Pesticide programs are included. (Author abstract by permission)

**77-1376.** Environ. Protect. Ag., Region X (Seattle, WA). **Environmental quality profile 1976. Alaska, Oregon, Idaho, Washington.** *Natl. Tech. Inform. Serv.* PB-255,101, 1976, 28 p.

This document provides an overview of the environmental quality of EPA's Region X - Alaska, Idaho, Oregon, and Washington. It is intended to help develop an overall perspective on environmental issues as well as to assist in policy analysis, program management, and program evaluation. All the basic data came from annual reports submitted by the states to EPA. Pesticides information is included. (Author abstract by permission)

**77-1377.** Lockeretz, W.; Klepper, R.; Commoner, B.; Gertler, M.; Fast, S. (Cent. Biol. Natur. Syst., Washington Univ., St. Louis, MO). **Organic and conventional crop production in the corn belt: a comparison of economic performance and energy use for selected farms.** *Natl. Tech. Inform. Serv.* PB-255,458, 1976, 49 p.

The report describes a two year study of fourteen pairs of crop-livestock farms in the Corn Belt, in which one member of each pair used only organic fertilization methods and no pesticides, while the other used conventional fertilizers and pesticides. Data are presented on the yields, production costs, and net returns of crop production on these farms for 1974 and 1975. Results also are given on the comparative energy consumption, labor intensiveness, and plant nutrient balance. (Author abstract by permission)

**77-1378.** Berkowitz, J.; Stevens, J.; Arnold, D.; Goyer, M.; Senechal, D. (Arthur D. Little Inc., Cambridge, MA). **Substitute chemical program--initial scientific review of PCNB.** *Natl. Tech. Inform. Serv.* PB-255,787, 1976, 71 p.

This report contains the safety and efficacy initial scientific review of PCNB. PCNB was identified as a registered substitute chemical for certain problematic uses of ethylenebisdithiocarbamate (EBDC) fungicides which are under EPA review for suspected adverse effects. The report covers all uses of PCNB and is intended to be adaptable to future needs. Should PCNB be identified as a substitute for a problem pesticide other than the EBDC fungicides, the review can be updated in Jan. 1976. The report summarizes rather than interprets scientific data reviewed during the course of the studies. Data from different sources is not correlated, nor are opinions presented on contradictory findings. (Author abstract by permission)

**77-1379.** Water Resour. Sci. Inform. Cent. (Off. Water Res. Technol., Washington, DC). **Agricultural runoff. A bibliography. Volume 2.** *Natl. Tech. Inform. Serv.* PB-255,849, 1976, 292 p. (187 references)

The report, containing 187 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 95,781 abstracts covering SWRA through April 15, 1976 (Volume 9, Number 8). Author and subject indexes are included. The first volume (see W72-05840) was issued in January 1972 and covered the material announced in SWRA from October 1968 through December 1971. This volume covers the period from January 1972 through April 1976. (Author abstract by permission)

**77-1380.** Water Resour. Sci. Inform. Ctr. (Off. Water Res. Technol., Washington, DC). **DDT in water. A bibliography. Volume 2.** *Natl. Tech. Inform. Serv.* PB-255,280, 1976, 794 p. (486 references)

The report, containing 486 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising Selected Water Resources Abstracts (SWRA). The first volume (ss W72-14431) was issued in October 1971 and covered the material announced in SWRA from October 1968 through October 1971. At the time of search for this bibliography, the data base had 95,781 abstracts covering SWRA through April 15, 1976 (Volume 9, Number 8). Author and subject indexes are included. Pesticides information is covered. (Author abstract by permission)

**77-1381.** Office Program Manage. (Environ. Protect. Ag., Washington, DC). **National Environmental Research Center/Program Directory.** *Natl. Tech. Inform. Serv.* PB-256,497, 1974, 60 p.

This new Directory replaces the OR&D Technical Personnel Access Directory and the Laboratory Operations Division publication, National Environmental Research Center Directory. Following is a description of the contents: OR&D Organization Directory - this is an organization directory of the Office of Research and Development showing responsible individuals to the Branch level. Directory of OR&D Program Elements - this directory shows the Program Element structure of OR&D giving the Program element number, title of responsible Program Area Manager and Program Element Director. Alphabetical Directory of OR&D Key Personnel - alphabetized directory of all individuals listed on the NERC/Program Directory. It also contains their organization, mailing addresses and telephone numbers. Organization and functions, Office of Research and Development - narrative description of work being performed in each organizational subdivision of OR&D. (Author abstract by permission)

**77-1382.** Lehmann, E. J. (Natl. Tech. Inform. Serv., Springfield, VA). **DDT, DDD and DDE pesticides (a bibliography with abstracts).** *Natl. Tech. Inform. Serv.* NTIS/PS-76/0696, 1976, 212 p.

Research on DDT, DDD, and DDE pesticides are covered. This includes their ecological effects, pollution, uses, biodegradation, and accumulation in animals and plants. (This updated bibliography contains 210 abstracts, 36 of which are new entries to the previous edition.) (Author abstract by permission)

**77-1383.** Kaufman, D. D. (Pestic. Degradation Lab., Agric. Environ. Qual. Inst., Beltsville, MD 20705). **Bound and conjugated pesticide residues.** *ACS Symp. Ser.* 29: 1-10; 1976.

Almost all biological systems produce bound and conjugated pesticide residues. Protocols are under investigation for the isolation, characterization, and evaluation of these residues. Different procedures may be required for extraction of bound residues from plant, animal, and soil systems. Processing the extracts through biological systems different from the first would provide an indication of the biological availability of the product. The significance of the available bound residues could be assessed based on the actual percent of bound material released, the side effects on the consuming system, and the toxicologic properties of the parent pesticide or its most toxic metabolites. Establishment of a standardized protocol has the advantage of providing a uniform evaluation system and the disadvantage of possibly becoming limiting.

**77-1384.** Stevenson, F. J. (Dep. Agron., Univ. Illinois, Urbana, IL 61801). **Organic matter reactions involving pesticides in soil.** *ACS Symp. Ser.* 29: 180-207; 1976. (83 references)

Reactions of pesticides with organic matter represent a key factor in their behavior in soil, both as concerns availability and as concerns degradation. The humic substances (pigmented polymers) are a highly complex and active chemical system. Not only the amounts but also the types of organic matter present vary widely in different soils. These differences have implications with respect to correlation studies of pesticide performance and organic matter content. Organic compounds containing the nucleophilic reactive groups that are present in humic and fulvic acids bring about changes in many pesticides. Humic substances are also rather strong reducing agents, and stable free radicals have also been detected in humic and fulvic acids. Some pesticides or their decomposition products can become part of the pool of precursor molecules for humus synthesis and thereby lose their identity. Adsorption mechanisms demonstrated for pesticides in soil include ion exchange, protonation, hydrogen bonding, van der Waals forces, and ligand exchange.

**77-1385.** White, J. L. (Dep. Agron., Purdue Univ., West Lafayette, IN 47907). **Clay-pesticide interactions.** *ACS Symp. Ser.* 29: 208-218; 1976. (29 references)

The current status of information on clay-pesticide interactions was reviewed in relation to the problem of "bound" or unavailable residues. Because of its high surface area the colloidal fraction of soil is of major importance in the interaction between pesticide molecules and soil. The layer lattice silicate type which consists of two sheets of tetrahedrally coordinated cations with one sheet of octahedrally coordinated cations provides for an interlayer region that can accommodate foreign cations including pesticides. Clay minerals serve as proton donors, which may enhance adsorption of basic pesticides as well as degradation of some pesticides. Principal adsorption mechanisms include physical adsorption and chemisorption; the adsorption mechanism determines the ease of displacement and the bioavailability of pesticides. Typical adsorption studies involving short term exposure to systems with water/soil ratios much higher than those under field conditions may be irrelevant to natural conditions, as they neglect the effects of time and cyclic variations in temperature and moisture content. Surface chemistry studies using IR and UV techniques can provide useful information on protonation, hydrolysis, degradation, and biological activity of adsorbed pesticides.

**77-1386.** Hamaker, J. W.; Goring, C. A. I. (Dow Chem. U.S.A., Ag-Organics Dep., Walnut Creek, CA). **Turnover of pesticide residues in soil.** *ACS Symp. Ser.* 29: 239-243; 1976. (5 references)

A model for decomposition and movement of pesticides in soil is proposed. The soil residue is partitioned into two reservoirs: a mobil/labile fraction and an immobile, degradation-resistant fraction. The rate of chemical degradation thus depends on the portion of chemical found in the labile fraction. First-order rate constants were assigned for quantitation purposes to the rates of degradation, of entry into the bound condition, and of leaving the bound condition. The resulting system of differential equations was solved, and degradation curves were calculated for the three rate constants over a range of values. The calculated curves showed good agreement with experimental results. Accumulation of soil residues from repeated annual additions of trichlorpyr was investigated mathematically for 90% degradation in a year and different sizes of mobile and immobile reservoir in different soil types. Results indicated that accumulation would not be excessive (would not exceed twice the first-year residue). Any accumulation would be handled in that a large degradation rate would quickly break down material released from the unavailable state.

**77-1387.** Bartha, R.; Hsu, T. S. (Dep. Biochem. Microbiol., Cook College, Rutgers Univ., New Brunswick, NJ). **Spectroscopic characterization of soil organic matter.** *ACS Symp. Ser.* 29: 258-271; 1976. (51 references)

Pesticide residues in soil or in natural waters

containing dissolved humic substances may become undetectable by conventional analytical techniques, while radiotracer evidence indicates that they have not become mineralized. A nondestructive technique is therefore desirable for bound residue analysis and for studying the nature of their chemical (covalent) attachment. One such technique is offered by spectrometry, including UV, IR, ESR, and NMR spectrometry. The large molecular size and heterogeneous nature of humic substances makes spectrometric studies complicated, but nevertheless useful information can be gained. A technique which has met with some success is the selection of a specific line shift to provide evidence for or against a given reaction. In one such application the IR spectra of DCA (3,4-dichloroaniline, a herbicide degradation product), humic acid, and the DCA-humic acid complex were prepared. A number of reactions can be suggested to account for the nonhydrolyzable binding of anilines to humic substances and are being examined using spectrometric and other techniques.

**77-1388.** Meikle, R. W.; Regoli, A. J.; Kurihara, N. H.; Laskowski, D. A. (Dow Chem. U.S.A., Ag-Organics Res., Walnut Creek, CA 94598). **Classification of bound residues soil organic matter: polymeric nature of residues in humic substance.** *ACS Symp. Ser.* 29: 272-284; 1976. (24 references)

Fractionation of radioactive humic substances extracted from soil following treatment with radiolabeled ditalimfor fungicide may be achieved on Sephadex polydextran gels. Either dilute aqueous sodium hydroxide or Dowex A-1 chelating resin and water may be used for extraction of the soils to obtain radioactive humic substances. There are at least two radioactive polymer fractions, a high molecular weight one and a low molecular weight fraction, corresponding roughly to fulvic and humic acid reactions. The more soluble soil organic carbon fractions appear to have a more rapid turnover than the higher molecular weight one. During the sequence of reactions from simple molecules to humic-like insoluble substances the $^{14}C$ from the pesticides breakdown products becomes an integral part of the molecular structure, without recognizable relation to the parent molecule. The rate of humin degradation and therefore the rate of degradation of incorporated materials is very slow.

**77-1389.** Riley, D.; Wilkinson, W.; Tucker, B. V. (ICI Plant Protect. Div., Jealott's Hill Res. Stn., Bracknell, Berkshire, England). **Biological unavailability of bound paraquat residues in soil.** *ACS Symp. Ser.* 29: 301-353; 1976. (75 references)

Paraquat is normally applied as a spray at rates of 0.1 to 2 kg/ha (cation basis). The amount of paraquat which reaches the soil can range from 10% to almost 100% of the amount applied. Once in soil it transfers from other soil components to clay minerals which adsorb it strongly and lastingly. The availability of paraquat to plants may be characterized by bioassay tests or by the extent of desorption with saturated ammonium chloride; these two factors are closely correlated. Studies on bound paraquat were conducted with organisms other than plants as well. Bound paraquat soil residues are apparently not absorbed by worm tissue, and they have no effect on microarthropods or microorganisms. Bound paraquat in soil is not degraded, even when the soils contain organisms such as *Lipomyces* spp. which are capable of degrading paraquat in culture solutions. Continued application of paraquat did not leave any harmful residues in the soil.

**77-1390.** Weber, J. B. (North Carolina State Univ., Raleigh, NC). **Fixed and biologically available soil bound pesticides.** *ACS Symp. Ser.* 29: 354-355; 1976.

In addition to irreversibly bound pesticide residues, certain pesticides or metabolites are less strongly bound to soil colloids. In such cases the chemical may be extracted from soil under not-too-rigorous conditions and may be readily separated from soil fractions using chromatographic techniques. The biological availability of soil-bound pesticides depends on the adsorption mechanisms involved, as well as soil factors. Cationic pesticides are ionically bound to negatively charged soil colloids and are readily desorbed from some organic colloids and some clay minerals with salt solutions. Adsorption and biological availability of basic pesticides such as *s*-triazine herbicides depend on soil pH. Most acidic pesticides other than those containing phosphorus and arsenic are weakly adsorbed. Highly hydrophobic pesticides such as the dinitroanilines gradually become associated with the lipophilic portion of organic soil colloids.

**77-1391.** Fuhr, F. (Arbeitsgruppe Radioagron., Kernforschungsanlage Juelich GmbH, D 517 Juelich, Germany). **An experimental approach to the study of the plant availability of soil bound pesticide residues.** *ACS Symp. Ser.* 29: 356-357; 1976.

Standard lysimeter experiments are conducted under outdoor conditions using either topsoil or undisturbed soil columns to simulate practical pesticide application. Methabenzthiazuron was found to be very stable in a lysimeter experiment with spring wheat. At harvest time 83% of the applied $^{14}C$ was still in the soil, preferentially in the upper 5 cm layer, and almost 90% of the acetone-extractable portion remained as methabenzthiazuron. Crops planted after wheat harvest took up about 1% of the $^{14}C$ residues from soil, and the rye contained only

1/10 of the residual compounds derived from methabenzthiazuron that were found in the wheat. Methabenzthiazuron was not detected in the plant material.

**77-1392.** Bartha, R.; Hsu, T. S. (Rutgers Univ., New Brunswick, NJ). **Chloroaniline-humus complexes — formation, persistence, and problems in monitoring.** *ACS Symp. Ser.* 29: 362-363; 1976. (3 references)

Microbial metabolism of some phenylamide herbicides results in reactive chloroaniline moieties, which mostly become inactivated by spontaneous interactions with soil. About 50% of chloroaniline chemically bound in a test soil was recovered by alkaline hydrolysis. This portion seemed to be bound as anil or anilinoquinone. The remainder was apparently attached by heterocyclic ring closure and/or ether bond mechanisms. Two distinct degradation mechanisms were implicated in degradation of purified chloroaniline-humus complexes by *Penicillium frequentans* and *Aspergillus versicolor* cultures. The proportion of the hydrolyzable fraction of purified chloroaniline-humus complexes decreased with time, while the amount of nonhydrolyzable residue increased during 190 days of incubation in natural soil. Chloroanilines immobilized as non-hydrolyzable humic complexes are not detectable with currently available technique other than radiotracer methods, making monitoring difficult. Some soil microorganisms appear to be able to gradually remineralize or remobilize the bound chloroaniline residue.

**77-1393.** Booth, G. M.; Rhees, R. W.; Ferrell, D.; Larsen, J. R. (Brigham Young Univ., Provo, UT 84601). **Determination of the release of bound fluchloralin residues from soil into water.** *ACS Symp. Ser.* 29: 364-365; 1976.

Soil that had been aged for 18 mo after treatment with $^{14}$C-fluchloralin was exhaustively extracted three times with methanol, then three times with hexane, and the extracts were analyzed by TLC. Results were compared with a determination of total $^{14}$C obtained using a biological material oxidizer. No residues were detected in the hexane extracts; 14.73% of the total residues were extracted with methanol. Fluchloralin (parent compound) accounted for 76.38% of the total methanol-extracted residues from the aged soil. Only small amounts of total bound fluchoralin residues were released into water during 128 days of incubation. Various regimens of photoperiod and sterility had little effect on residue release. Fluchloralin accounted for about 85% of the total residues released into the water.

**77-1394.** Helling, C. S. (Agric. Res. Serv., U.S. Dep. Agric., Beltsville, MD 20705). **Dinitroaniline herbicide bound residues in soils.** *ACS Symp. Ser.* 29: 366-367; 1976.

Six-month aerobic and anaerobic incubation of (*ring*-$^{14}$C)butralin in Chillum soil resulted in 3.0 and 12.8% respective conversions to bound residue. When humic and fulvic acids were extracted by a classical procedure, 61% of the bound butralin residue was present in fulvic acid in the aerobic soil and 6% in humic acid. In anaerobic Chillum soil 18% and 33% were in fulvic and humic acids respectively. The remainder was defined as in humin. Additional ring-labeled dinitroaniline herbicides were aerobically incubated in Matapeake silt loam; the resulting relative distribution of bound $^{14}$C was similar among the dinitroanilines, except for higher residues in humin for trifluralin and dinitramine. Bound butralin appeared to be principally localized in more "highly humified" fractions. Incubation of Chillum soil containing bound residues with biologically active Matapeake soil resulted in a slow decline in residual $^{14}$C during 21 wk of incubation. Projected half lives for bound butralin in different soil fractions ranged from 10 mo to 3 yr.

**77-1395.** Kearney, P. C. (Pestic. Degradation Lab., Agric. Res. Serv., Beltsville, MD 20705). **Summary of soil bound residues discussion session.** *ACS Symp. Ser.* 29: 378-382; 1977.

Three major questions were considered in the discussion section on soil bound residues. First, criteria were discussed for determining when in-depth studies on soil bound pesticide residues are needed. Unfavorable reaction to a proposal for standardized residue studies stemmed from the fact that methodology is not yet well developed and the significance of variously bound residues is controversial. The adequacy of existing methods for evaluating soil bound residues was next questioned. The method recommended by the Chemistry Task Group of the American Institute of Biological Sciences has the disadvantage of employing strong reagents and therefore possibly compromising the integrity of the extracted components. However, it remains widely used because of its convenience and history of useful results. The components of the environment least likely to be affected by soil bound residues, according to the final discussion point, are higher animals including man. Directly affected components include agronomic plants, aquatic organisms, soil processes, and soil organisms. Controversy continues on whether soil binding represents a dangerous source for subsequent release of pesticides or a safe disposal method. Proponents of the latter view believe the toxic residues are immobilized and thereby made accessible to degradation.

**77-1396.** Crosby, D. G. (Dep. Environ. Toxicol., Univ. California, Davis, CA). **The environmental**

**chemistry of herbicides.** *ACS Symp. Ser.* 37: 93-108; 1977. (44 references)

An extremely oversimplified view of the existing situation would write a reaction in which herbicides were converted to nontoxic inorganic products. Studies of the intermediate steps in this process are now underway. Herbicides encompass a wide range of structural types, but most of their reactions can be characterized as oxidation, reduction, nucleophilic displacements (such as hydrolysis), elimination, and addition. Reactions in the environment generally proceed more slowly than under laboratory conditions, but may be markedly accelerated by the energy of sunlight. Biochemical acceleration also occurs. Chemicals naturally present in the environment have recently been shown to mediate in reactions such as oxidation, diazotization, and photodecomposition. Herbicides have also provided insight into plant processes. The variety of detoxication mechanisms demonstrated within the plant kingdom suggests that ability to defend against chemical stress has had evolutionary value throughout eons of development. The use of plant-control chemicals has doubled within the past ten years. Studies are currently underway to elucidate the fate of herbicides in the environment and maximize their utility.

**77-1397.** Sackmauerova, M.; Palusova, O.; Szokolay, A.; Uhnak, J. (Nat. Inst. Hyg., Bratislava, Czechoslovakia). **Dynamika rezidui organochlorovych pesticidov v biocenoze rieky Dunaj. [Dynamics of the residues of chlorinated pesticides in the biocenosis of the Danube river.]** *Agrochemia (Bratislava)* 17(2): 46-48; 1977. (17 references) (Czech)

Chlorinated insecticide levels, examined in water, mud, plants, and fish of the Danube river between 1971 and 1974, demonstrated a high degree of contamination. Accumulation factors of 1,000 to 10,000 were seen when BHC isomer, DDT, and DDT residue levels in water were compared to those in predatory fish. Average concentrations of the individual BHC isomers in water ranged from 0.006 to 0.197 $\mu g/dm^3$, DDE from 0.006 to 0.128 $\mu g/dm^3$, and DDT from 0.098 to 0.165 $\mu g/dm^3$. The average contents of individual BHC isomers in fish ranged from undetectable to 0.106 mg/kg, DDE 0.085 to 2.58 mg/kg, and DDT 0.070 to 2.25 mg/kg. The values for relative cumulation of BHC residues in fish and mud in comparison with water plants indicate different dynamics than those for DDT and DDE.

**77-1398.** Cripe, C. R.; Livingston, R. J. (Dep. Biol. Sci., Florida State Univ., Tallahassee, FL 32306). **Dynamics of mirex and its principal photoproducts in a simulated marsh system.** *Arch. Environ. Contam. Toxicol.* 5(3): 295-303; 1977. (19 references)

Three simulated marsh systems were constructed, containing sediment, marsh plants, oysters, blue crabs, fiddler crabs, and two species of top minnows. Seawater entered each of the pools by flowing across a trough, two of which contained Mirex bait. Tidal fluctuations were simulated. Samples of water, bait, and animals were periodically analyzed. All animals concentrated Mirex. Three photoproducts accumulated on the bait particles, and both oysters and one species of fish accumulated one of the photoproducts. (Author abstract by permission)

**77-1399.** Agarwal, H. C.; Pillai, M. K. K.; Yadav, D. V.; Menon, K. B.; Gupta, R. K. (Dep. Zool., Univ. Delhi, Delhi 110007, India). **Residues of DDT and its metabolites in human blood samples in Delhi, India.** *Bull. WHO* 54(3): 349-351; 1976. (8 references)

Blood samples from 182 people in Delhi, India, were examined for DDT residues. All except 8 contained DDT and its metabolites. The average total DDT concentration in the whole blood ranged from 0.177 to 0.683 mg/liter in males and from 0.166 to 0.329 mg/liter in females. The DDT metabolites detected were *p,p'*-DDE, *p,p'*-DDD, and *o,p'*-DDT. DDE accounted for most of the total DDT. (Author abstract by permission)

**77-1400.** Polishuk, Z. W.; Wassermann, D.; Wassermann, M.; Cucos, S.; Ron, M. (Dep. Gynecol. Obstet., Hebrew Univ.-Hadassah Med. Sch., Jerusalem, Israel). **Organochlorine compounds in mother and fetus during labor.** *Environ. Res.* 13(2): 278-284; 1977. (13 references)

Some features of the storage of organochlorine compounds in mother and fetus as assessed during labor are reported in this paper. Organochlorine insecticides (DDT and metabolites, dieldrin, γ-BHC, and heptachlor epoxide) and polychlorinated biphenyls were assessed in maternal adipose tissue, maternal blood, fetal blood, maternal uterine muscle, placenta, and amniotic fluid. The concentration of total DDT, γ-BHC, and PCBs was greater in extracted lipids of fetal blood than in maternal blood and still higher in the uterine muscle. The concentration of dieldrin and heptachlor expoxide was higher in extracted lipids of fetal blood and placenta than in maternal blood and uterine muscle. The metabolites of DDT were found in different ratios in mother and fetus. The ratios for individual polychlorinated biphenyls compounds were similar for maternal and fetal plasma on the one hand and placenta and uterine muscle on the other. The facts suggest quantitative differences in the ability of these tissues to metabolize and/or store organochlorine compounds. These data emphasize the importance of the maternal organism in protection of the fetus against environmental hazards.

**77-1401.** Dorough, H. W.; Whitacre, D. M. (Dep. Entomol., Univ. Kentucky, Lexington, KY 40506). **Persistence and metabolism of $^{14}$C-leptophos in burley tobacco.** *J. Econ. Entomol.* 70(2): 153-155; 1977. (7 references)

An acetone solution of $^{14}$C-leptophos [*O*-2,5-dichloro -4- bromophenyl) *O*-methyl phenylthiophosphonate] was applied in the field to leaves of burley tobacco plants at a rate equivalent to 1 lb AI/acre. Initial residues of ca. 300 ppm declined by 70% after 7 days and by ca. 85% after 21 days. Most of the radiocarbon (80+%) extracted from the leaves at any interval was as the applied compound, indicating very little metabolism within the leaf. The remaining $^{14}$C-residues consisted of small amounts of the oxygen analogue, hydrolysis products, and unknown polar and bound materials. Phenylphosphoric acid was the only metabolite which consistently increased with time (0.6 ppm at 0 time to 3.3 ppm after 21 days). The other products varied in concentration during the 21-day test but individually seldom exceeded 1 ppm.

**77-1402.** Lichtenstein, E. P.; Shulz, K. R.; Liang, T. T. (Dep. Entomol., Univ. Wisconsin, Madison, WI 53706). **Fate of fresh and aged soil residues of the insecticide $^{14}$C-N-2596 in a soil-corn-water ecosystem.** *J. Econ. Entomol.* 70(2): 169-175; 1977. (13 references)

The persistence, translocation, metabolism and movement of freshly deposited and 6-months-aged soil residues of the insecticide Stauffer [$^{14}$C]-N-2596 (*O*-ethyl-*S*- (*p*-chlorophenyl) ethylphosphonodithioate) were studied in a soil-plant-water ecosystem. The effects of percolating water on the plants were also investigated. Data indicate that under the described laboratory conditions [$^{14}$C]-N-2596 had a half life to 6-7 months and that its mobility in soils was comparatively insignificant. This latter property could be of advantage from an environmental point of view since contamination of water or plants grown in these soils is rather limited. In comparison to freshly treated soils, studies with 6-month-old residues of [$^{14}$C]-N-2596 showed that no qualitative differences in the insecticide metabolism were evident. Only an increase in the amounts of water-soluble and bound soil residues, coupled with a decrease of benzene-soluble compounds, was noticed after 6 months. This, however, had no effect on the penetration, translocation and metabolism of the insecticide or its metabolites in corn plants, except that roots and in particular corn leaves contained more water-soluble $^{14}$C-compounds. It appears that the translocation and metabolism of the insecticide in the plant are primarily governed by internal, physiological factors. Percolation of water through these soils resulted in a reduction of noninsecticidal water-soluble $^{14}$C-compounds in comparison to nonpercolated moist soil. (Author abstract by permission)

**77-1403.** Sakai, A.; Tanimura, A. (Dep. Food Additives, Nat. Inst. Hyg. Sci., Tokyo, Japan). **Studies on *N*-nitroso derivatives of *N*-methylcarbamate insecticides (I). Properties of *N*-nitroso derivatives of 3-methylphenyl *N*-methylcarbamate, 3,4-dimethylphenyl *N*-methylcarbamate and naphthyl *N*-methylcarbamate.** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 18(2): 164-169; 1977. (11 references)

*N*-methylcarbamate insecticides have come to be widely used in Japan in place of organochlorines. The *N*-nitroso derivatives of three such insecticides, MTMC, MPMP, and carbaryl, were crystallized and their physico-chemical properties and stabilities were studied. These *N*-nitrosocarbamates were rather stable at room temperature in organic solvent in the dark but were extremely unstable to light. The nitroso derivatives of MTMC and MPMC in particular were completely decomposed when 10 m*M* solutions in ethanol were exposed to sunlight through glass for 3 hr. Degradation rates were increased with increasing solution acidity. Degradation of a 20 m*M* solution of nitroso-MTMC in 20% dimethylsulfoxide was much slower; decreases of 93 and 67% were seen at pH 5.8 and 1.2, respectively, and a temperature of 37° within 1 hr.

**77-1404.** Sakai, A.; Tanimura, A. (Dep. Food Additives, Nat. Inst. Hyg., Sci., Tokyo, Japan). **Studies on *N*-nitroso derivatives of *N*-methylcarbamate insecticides II. Kinetic studies on the *N*-nitrosocarbamate from 3-methylphenyl or 3,4-dimethyl phenyl *N*-methylcarbamate and sodium nitrite.** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 18(2): 170-175; 1977. (27 references)

The rates of formation of nitroso derivatives of *N*-methylcarbamate insecticides in the presence of sodium nitrite were examined. Initial formation rates of the nitroso derivative of MTMC were proportional to the concentrations of pesticide and sodium nitrite at pH 2.0 and 37°C in aqueous solution. The initial rates increased with increasing acidity of reaction mixtures, and were almost proportional to the hydrogen ion concentration from pH to pH 1.5. The initial rates of formation of the nitroso derivatives of MTMC and MPMC were practically identical at pH 2.0 and 37°C in 20% dimethyl sulfoxide.

**77-1405.** Selim, H. M.; Davidson, J. M.; Rao, P. S. C. (Soil Sci. Dep., Univ. Florida, Gainesville, FL 32611). **Transport of reactive solutes through multilayered soils.** *Soil Sci. Soc. Am. J.* 41(1): 141-142; 1977.

Solute transport through saturated and un-

saturated multilayed soils was studied using laboratory experiments and finite difference approximations of the solute transport equation. Soil-water and physical characteristics as well as solute sorption properties were measured and/or calculated for each soil layer. Linear and nonlinear equilibrium and kinetic adsorption processes were used to predict adsorption in each layer. Water flux was assumed constant for water-saturated and unsaturated layered soil profiles. For all adsorption processes considered, the calculated results showed that the order in which the soil layers were stratified in a water-saturated profile did not influence the effuent solute concentration distribution. For unsaturated layered soil profiles, the results showed that effluent solute distributions can be predicted with an average water content within individual soil layers. Experimental results from the miscible displacement of $^{36}Cl$ and $^{14}C$-labeled 2,4-D [(2,4-dichlorophenyl) acetic acid] through a two-layered soil column (Norge loam and Eustis sand) supported the calculated results. (Author abstract by permission)

**77-1406.** Brown, C. B.; Rahman, S. F. (Dep. Plant Soil Sci., Texas Tech. Univ., Lubbock, TX). **Chemical detoxication of atrazine by dexon.** *Soil Sci. Soc. Am. J.* 41(1): 141-142; 1977. (19 references)

The nonphytotoxic analogs of atrazine (2-chloro-4-ethylamino-6- isopropylamino-*s*- triazine) are hydroxyatrazine and protonated hydroxyatrazine. Distinctive infrared bands of these compounds appear at 1620, 1680, and 1740/cm, respectively. By monitoring these distinctive bands of the compounds, it has been demonstrated that in a combination of atrazine and dexon (*p*-[dimethylamino] benzenediazo sodium sulphonate) there is a time-dependent chemical change of some atrazine to protonated hydroxyatrazine indicating a reduction in phytotoxicity of the *s*-triazine. A part of dexon-atrazine antagonism—the reduction of atrazine toxicity to certain plants in the presence of dexon—is due to chemical reaction. (Author abstract by permission)

**77-1407.** Moriarty, F.; French, M. C. (Monks Wood Exper. Stn., Inst. Terrestrial Ecol., Huntingdon, England). **Mercury in waterways that drain into the Wash in eastern England.** *Water Res.* 11(4): 367-372; 1977. (10 references)

Recent studies have indicated that concentrations of mercury in the livers of wading birds increase during the winter when the birds are feeding in the Wash in eastern England. Total mercury analyses were therefore performed on sediment samples and some samples of water and gastropods from rivers and drainage ditches southwest of the Wash. Large-scale contamination was not apparent, but appreciable amounts of mercury were found in ditches from two bulb-dipping sites. The maximum mercury level in a sediment was 223 μg/g. Distribution of mercury from a discrete source is affected by water flow rates. Aquatic gastropods gave some indications of usefulness as monitors for detecting intermittent release. The relationship between depth of sediment sample and mercury level was examined, along with the effect of drying on mercury content of sediment samples. Air-drying at room temperature caused little or no loss of mercury in sediments containing mercury at several μg/g.

**77-1408.** Regula, E.; Wassermann, L. (Lab. Fa. Ulmer Spatz, Vater und Sohn, Eiselen, D-7910 Neu-Ulm, Germany). **Pesticidrueckstaende in Trockenaepfeln.** [**Pesticide residues in dried apples.**] *Z. Lebensm.-Unters. -Forsch* 163(2): 107-108; 1977. (6 references) (German)

Organochlorine and organophosphate residues were determined in 60 samples of dried apple cubes, flakes, and powder imported from Italy between April 1975 and May 1976. Small amounts of a variety of pesticides were found in a high percentage of the samples. Only total DDT was present in excess of 0.02 ppm in more than one sample. All of the values were well below West German tolerances. Total DDT levels in powdered apple were significantly higher than in apple cubes or flakes. Powdered apple contains some apple skin, and apple skin lipids retain DDT from the atmosphere or due to previous soil application.

**77-1409.** Small, R. D.; Scaiano, J. C. (Radiation Lab., Univ. Notre Dame, Notre Dame, IN 46556). **One electron reduction of paraquat dication by photogenerated biradicals.** *J. Photochem.* 6(6): 453-456; 1977. (17 references)

The one-electron reduction of paraquat dichloride is apparently important in determining the herbicidal and toxicologic properties of the ions. One known reaction leading to the reduction is the reaction with photogenerated ketyl radicals. The photochemistry of a series of phenyl-alkyl ketones (acetophenone to γ-methylvalerophenone) was examined in the presence of paraquat dichloride. Within this series the quantum yields of reaction increased with decreasing triplet lifetime. This indicated that the formation of the one-electron reduction product proceeds via a biradical mechanism rather than via the triplet state. The differences in quantum yields for the different ketones and the fact that the ratio of the quantum yields in the absence and in the presence of paraquat is nearly constant indicate that either the biradical lifetime or the quantium yield of biradical formation increases with increasing substitution at the γ-position. Thus paraquat cations are efficient traps for biradicals containing ketyl radical sites.

**77-1410.** Visweswariah, K.; Raju, S.; Majumder, S. K. (Cent. Food Technol. Res. Inst., Mysore, India). **Wood charcoal as a decontaminating agent for the removal of insecticides in water.** *Indian J. Environ. Health* 19(1): 30-37; 1977. (20 references)

Studies in India and elsewhere have revealed extensive contamination of potable and potentially potable water by pesticides, especially organochlorine insecticides. Experiments on decontamination of drinking water were therefore performed with activated charcoal, magnesium oxide, kaolinite, Fuller's earth, and silica gel. Magnesium oxide was inefficient for insecticide removal from saturated aqueous solutions. Granular wood charcoal was 90-95% effective in residue removal, whereas activated charcoal proved to be the most effective. It removed only about half of the BHC present in aqueous solution when added at the rate of 1%, whereas when added at 7% it was almost completely effective. Kaolinite at 5% was about 85% effective, and increasing the addition to 10% resulted in little improvement. Results with Fuller's earth were similar. Clay-charcoal combinations gave good results. Wood charcoal with a particle size of 35/40 mesh was adequately effective. Added to water at 4% it eliminated BHC, DDT, and lindane, and at 5% it effectively removed parathion, fenitrothion and cidial. Only about 80% of the saturation quantity of malathion was removed. The use of wood charcoal for insecticide removal in small filter units for drinking water seems practical.

**77-1411.** Steinwandter, H.; Bruene, J. (Hessische Landwirtschaftl. Versuchsanst., D-6100 Darmstadt, Germany). **Kein natuerliches Vorkommen von Hexachlorbenzol in der Oekosphaere. [No natural occurrence of hexachlorobenzene in the ecosphere.]** *Chemosphere* 6(2/3): 77-80; 1977. (10 references) (German)

The sources of the relatively high levels of hexachlorobenzene in the ecosphere are as yet unknown. The amounts present far exceed those directly dispersed for agricultural purposes. The question of natural HCB formation in the ecosphere was raised by the observation that microorganisms are capable of synthesizing multiply chlorinated benzenes. HCB levels were examined in six specimens of preserved human fat, obtained between 1896 and 1930, and in specimens from persons who died in 1973-1974. No HCB was detectable (detection limit 0.001 ppm) in the samples taken in 1896, 1927, and 1930; 0.0043 ppm was found in a sample from 1920, 0.0064 ppm in a sample from 1923, and 0.32 ppm in a sample from 1900. HCB values in the 15 recent samples were between 3.5 and 15 ppm. Contamination of the older samples might have been due to individual (laboratory?) contact with HCB or to contamination of the preserved specimens. The excess amounts of HCB present in current samples may be due to the use of HCB as a plasticizer and flame retardant in plastics, the presence of HCB in other pesticides as such quintozene (PCNB) and dacthal, or to the conversion of PCP to HCB during wood burning and finally to conversion of lindane to HCB.

**77-1412.** Meiners, A. F.; Mumma, C. E.; Ferguson, T. L.; Kelso, G. L. (Midwest Res. Inst., Kansas City, MO). **Wastewater treatment technology documentation for aldrin/dieldrin manufacture.** *Natl. Tech. Inform. Serv.* PB-254,011, 1976, 48 p.

The report was prepared to provide technologic supporting information for toxic pollutant effluent standards proposed by EPA under S307(a) of the Federal Water Pollution Control Act Amendments of 1972. The report identifies potential technologies, assesses implementation feasibility, estimates final effluent characteristics and estimates installation and operation costs for aldrin/dieldrin manufacturers. (Author abstract by permission)

**77-1413.** Meiners, A. F.; Mumma, C. E.; Ferguson, T. L.; Kelso, G. L. (Midwest Res. Inst. Kansas City, MO). **Wastewater treatment technology documentation for DDT manufacture.** *Natl. Tech. Inform. Serv.* PB-254,013, 1976, 99 p.

The report was prepared to provide technologic supporting information for toxic pollutant effluent standards proposed by EPA under S 307(a) of the Federal Water Pollution Control Act Amendments of 1972. The report identifies potential technologies, assesses implementation feasibility, estimates final effluent characteristics and estimates installation and operation costs for DDT manufacturers. (Author abstract by permission)

**77-1414.** Meiners, A. F.; Mumma, C. A.; Ferguson, T. L.; Kelso, G. L. (Midwest Res. Inst., Kansas City, MO). **Wastewater treatment technology for endrin manufacture.** *Natl. Tech. Inform. Serv.* PB-254,015, 11976, 102 p.

The report was prepared to provide technologic supporting information for toxic pollutant effluent standards proposed by EPA under S307(a) of the Federal Water Pollution Control Act Amendments of 1972. The report identifies potential technologies, assesses implementation feasibility, estimates final effluent characteristics and estimates installation and operation costs for endrin manufacturers. (Author abstract by permission)

**77-1415.** Meiners, A. F.; Mumma, C. E.; Ferguson, T. L.; Kelso, G. L. (Midwest Res. Inst., Kansas City, MO). **Wastewater treatment technology documentation. Formulation of aldrin/dieldrin, DDT, endrin,**

**toxaphene.** *Natl. Tech. Inform. Serv.* PB-254-017. 1976. 130 p.

The report was prepared to provide technologic supporting information for toxic pollutant effluent standards proposed by EPA under S307(a) of the Federal Water Pollution Control act Amendments of 1972. The report identifies potential technologies, assesses implementation feasibility, estimates final effluent characteristics, and estimates installation and operation costs for aldrin/dieldrin, DDT, endrin, and toxaphene formulation. (Author abstract by permission)

**77-1416.** Carrier, N. E.; Gillespie, W. T.; Brezonik, P. L. (Water Resour. Res. Ctr., Florida Univ., Gainesville, FL). **Boron and arsenic studies in Florida waters.** *Natl. Tech. Inform. Serv.* PB-255,182. 1976. 108 p.

Levels of arsenic and boron in Florida natural waters have been measured and found generally to be low and not of toxic concern. Boron levels in municipal sewage effluent are high enough to cause phytotoxicity, at least to sensitive plants such as citrus. The source of the elevated boron levels in sewage evidently is detergent use of borates as softeners and perborates as bleaching agents. Analysis of boron in rainfall found increasing concentrations near the coasts, indicating marine-derived aerosols are an important source of boron in the natural cycle of boron in Florida. Boron is a relatively conservative substance and model ecosystem studies indicate little toxic hazard and little bioaccumulation at the boron levels expected in natural waters. Arsenic levels in Florida surface and ground waters were found to be normally quite low (a few ppb) to undetectable (less than 1 ppb). Canals in South Florida around Lake Okeechobee had higher levels than other parts of the state, with detectable levels in almost all samples and a mean of 5 ppb. The arsenic cycle in aquatic systems appears to be sediment dominated. In citrus grove soils arsenic was associated mainly with the iron fraction, but in anaerobic Lake Apopka sediments, arsenic was present primarily in a leachable 'water soluble' form and was present as As III. Catfish from Lake Apopka do not appear to concentrate arsenic, but waterhyacinths from Lake Apopka had about 1 ppm (dry wt). (Author abstract by permission)

**77-1417.** Culp, R. L. (Clean Water Consultants, El Dorado, CA). **Technical guidelines for public water systems.** *Natl. Tech. Inform. Serv.* PB-255,217. 1976. 474 p.

This report presents technical guidelines for the design, operation, maintenance, staffing, and surveillance of public water systems including references and bibliography. Topics discussed include: general design considerations, source development, treatment, chemical application, pumping facilities, storage, distribution systems, operation and maintenance, surveillance, and personnel. Removal of contaminants (inorganic and organic chemicals, pesticides, trace elements, metals, radioisotopes) from waste water and in preparation of drinking water are discussed. (Author abstract by permission)

**77-1418.** Cogger, W. J.; Payne, M. L.; Sprenger, L. D. (Environ. Protect. Ag., Region VIII, Denver, CO). **Water quality inventory.** *Natl. Tech. Inform. Serv.* PB-255,266. 1975. 248 p.

Water quality in Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming is discussed. Pollution from zinc, copper, lead, mercury, selenium, radium, barium, and cadmium is considered. Color illustrations reproduced in black and white. Pesticides are considered in the role of water pollutants. (Author abstract by permission)

**77-1419.** Newlin, J. T.; Ward, R. C. (Coop. Extension Serv., Colorado State Univ., Fort Collins, CO). **An analysis of non-point source pollution in the Rocky Mountain-prairie region. Preliminary draft. Part I.** *Natl. Tech. Inform. Serv.* PB-255,273. 1974. 433 p.

The purpose of this report is to provide a description of the identified non-point sources of pollution within the six-state area of Colorado, Utah, Wyoming, Montana, North Dakota, and South Dakota which comprises Region VIII under the jurisdiction of the Environmental Protection Agency's Denver office. The areas of concern which have been investigated and reported upon include: irrigation return flows, range and watershed management, logging and forestry, rural-domestic wastes, livestock and waste disposal, pesticides and fertilizers, land disposal, and surface and groundwater problems. (Author abstract by permission)

**77-1420.** Off. Intl. Environ. Programs (Smithsonian Institution, Washington, DC). **Coastal zone pollution in Indonesia -- a reconnaissance survey.** *Natl. Tech. Inform. Serv.* PB-255,447. 1974. 203 p.

A number of catastrophic marine oil spills in the 1960's and in 1970 alerted the world to the hazards and impacts of other serious kinds of pollution and sparked pollution control initiatives in many countries of the world. Environmental impacts associated with international development led to the undertaking of the present joint study on oil and other pollution in Indonesia's coastal waters. A survey was made of the impact of offshore oil exploitation. Miscellaneous pollutants including pesticides and industrial wastes were also considered. (Author abstract by permission)

**77-1421.** Tech. Invest. Br. (Environ. Protect. Ag., Denver, CO). **Clark Fork River study, Montana, July-August, 1973.** *Natl. Tech. Inform. Serv.* PB-255,580, 1974, 51 p.

The Environmental Protection Agency, Region VIII conducted an intensive field investigation of the Clark Fork River in the vicinity of Missoula, Montana during the period July 23 - August 3, 1973. The water quality and biological study of the 79 km (49 mile) reach of the river from Missoula downstream to Alberton, Montana was made to determine effects of seepage and/or discharges from the Hoerner Waldorf paper mill ponds. (Author abstract by permission)

**77-1422.** Quality Assurance Div. (Environ. Protect. Ag., Washington, DC). **Abbreviated list of publications and guideline documents dealing with monitoring quality assurance.** *Natl. Tech. Inform. Serv.* PB-256-462, 1974, 14 p.

In response to the Environmental Protection Agency's (EPA) environmental monitoring needs, the Agency's quality assurance program, within the Office of Research and Development, has assembled an abbreviated list of some of the more important documents that deal with monitoring quality assurance. Although this list covers all media, it is by no means exhaustive. It does, however, include many of the more popular documents that have been prepared by various components of EPA. Included, also, are some of the more relevant documents scheduled for future publication by EPA's quality assurance program. (Author abstract by permission)

**77-1423.** Baker, J. L.; Johnson, H. P.; Laflen, J. M. (Iowa State Water Resour. Res. Inst., Ames, IA). **Effect of tillage systems on runoff losses of pesticides: a simulated rainfall study.** *Natl. Tech. Inform. Serv.* PB-256,514, 1976, 108 p.

Pesticide losses were measured from small plots subjected to simulated rainfall. The plots were established at three locations in Iowa, each with different soils and slopes. The plots were tilled parallel to the slope by six different tillage practices. One insecticide (fonofos) and two herbicides (alachlor and cyanazine) were applied to the soil at recommended rates shortly before simulating two rains at 6.35 cm/hr and a third at 12.7 cm/hr (totaling 21.6 cm). Concentrations of all three pesticides in both sediment and water samples decreased significantly with time. Pesticide concentrations in water were correlated with percent residue cover. (Author abstract by permission)

**77-1424.** Goolsby, D.; Mattraw, H.; Lamonds, A.; Maddy, D.; Rollo, J. (Water Resour. Div., Geol. Survey, Tallahassee, FL). **Analysis of historical water-quality data and a network plan for the central and southern Florida flood control district.** *Natl. Tech. Inform. Serv.* PB-256,521, 1976, 131 p.

Historical water quality data from about 100 sampling stations on streams, canals and lakes in central and southern Florida were analyzed for areal and temporal variations in water quality, statistical measures of the data, relationships between water quality variables and long term changes or trends in water quality. Included in the analysis were data on the major inorganic chemical constituents, temperature, nitrogen and phosphorus species, trace metals, pesticides, organic carbon and biochemical oxygen demand. Based on the results of the analysis, the characteristics of the hydrologic system in central and southern Florida and the need for water quality data, a network was designed which would provide data to meet six specific objectives. These are: (1) water quality accounting, (2) areal assessments, (3) detection of gross longterm trends, (4) detection of toxic and deleterious substances, (5) establish a limnological data base on lakes and (6) furnish data on chemical inputs from the atmosphere. (Author abstract by permission)

**77-1425.** Numerical Data Advisory Bd. (Natl. Res. Council, Washington, DC). **Ad hoc advisory panel on evaluated physical property data in aid of aqueous environmental problems. Report on meeting, August 14-15, 1975.** *Natl. Tech. Inform. Serv.* PB-256,588, 1975, 92 p.

Report is made on an NAS-NRC Panel discussion of needs for evaluated physical and chemical property data of importance for environmental monitoring and effluent control, for the study of the fate of pollutants and for the establishment of meaningful standards. Systems include both organic and inorganic pollutants in solution and in the presence of particulate matter; properties include analytical, equilibrium, and surface properties. (Author abstract by permission)

**77-1426.** Taruski, A. G.; Olney, C. E.; Winn, H. E. (Graduate Sch. Oceanogr., Rhode Island Univ., Kingston, RI). **Chlorinated hydrocarbons in cetaceans.** *Natl. Tech. Inform. Serv.* AD-A026,496, 1975, 7 p.

DDT, PCBs, chlordane, and dieldrin levels were measured in blubber of 18 cetaceans, including humpback, sperm, dense-beaked, Altantic, and Pacific pilot whales, and five species of dolphins. All had significant residue levels, ranging from 1.1 to 1023 ppm IDDT (wet weight basis), and 0.7-147 ppm PCBs. These levels are high enough to justify efforts to reduce PCB contamination of the oceans and a continued ban on widespread use of DDT. (Author abstract by permission)

**77-1427.** Fulk, R.; Gruber, D.; Wullschleger, R. (Environ. Sci. Div., Envirex Inc., Milwaukee, WI). **Laboratory study of the release of pesticide and PCB materials to the water column during dredging and disposal operations.** *Natl. Tech. Inform. Serv.* AD-A026,685, 1975, 118 p.

Sediments, water column water, and interfacial water samples were obtained from dredged areas location in Calumet Harbor, Chicago; Green Bay near the mouth of the Fox River, Wisconsin; Mt. Hope Bay near Fall River, Massachusetts; Tabbs Bay near the Houston Ship Channel, Texas; and the Mississippi River near Memphis, Tennessee. Samples were analyzed for pesticide materials, PCB, oil and grease, total organic carbon, and silt and clay fraction. Measurable amounts of polychlorinated biphenyls (PCB) were found in almost all samples. Of the pesticides, dieldrin and DDT compounds were the most common. Aldrin and 2,4-D esters were present in a few samples. No correlation was found between the amount of TOC, oil and grease, and silt and clay fraction, and the sediment PCB content or the interstitial water PCB content. As a result of desorption tests and settling tests using several sediment to water ratios, the transfer of soluble pesticide material to the water was found to be negligible at sediment to water ratios of 1:10 or less. Chlorinated hydrocarbon materials associated with the resuspended solids reached concentrations at or near background water column levels after settling for periods ranging from 5 to 24 hr. (Author abstract by permission)

**77-1428.** Grasso, C. (Ist. Ig., Univ. Firenze, Florence, Italy). **Sul passagio transplacentare di insetticidi clorurati. [Transplancental passage of organochlorine insecticides.]** *IN: Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution.* Commission of the European Communities, Luxembourg, 1975, p. 861-878. (18 references) (Italian)

The chlorinated insecticides present in samples of blood taken from 70 puerperae and their children were investigated and identified. The samples were taken before the infants had been given their first breast or bottle feed. All chromatograms showed peaks of chlorinated insecticides. In all the samples *p,p'*-DDT was present in quantities exceeding 0.6 ppm; DDD and DDE were also ubiquitous. The other insecticides investigated (lindane, heptachlor, heptachlor epoxide, aldrin, and dieldrin) were present in most of the samples with the exception of heptachlor epoxide and dieldrin, which were found in only 4 and 9 samples respectively. The chromatograms of the insecticides taken from the blood of the mothers and their children were similar in quality, but not in quantity; the levels found in the mothers' blood in each case were higher than those for the children. The average levels of nearly all the insecticides, in the mothers as well as in the children, were higher for the subjects from Arezzo than for those from Florence. Further tests are underway to see whether these results can be correlated with the state of health of the newborn children.

**77-1429.** Colucci, A. V. (Environ. Protect. Ag., Research Triangle Park, NC). **Epidemiology of pesticide and metal residues.** *IN: Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution,* Commission of the European Communities, Luxembourg, 1975, p. 1043-1051.

Research models must be formulated in order to quantitate the impact of exposures involving multiple routes to man and to test specific hypotheses relating heavy metal and pesticide pollutants to adverse health effects. Crucial to all of these studies is the investigation of human body burdens of these residues using both the general population or selected subgroups at greater risk either from occupational or geographic exposure. Studies designed to address a number of questions in several areas have yielded interesting preliminary results to date. Whereas easily collected specimens such as hair and blood have proved utility in estimation of environmental exposure, these tissues cannot, as yet, be considered a good quantitative indicator of many body pollutant burdens. Studies of occupational indicator groups or groups of individuals with clinically evident disease have failed to clearly implicate pollutant burdens with either disease production or aggravation although, in general, the blood levels of these individuals do reflect increased exposure to pollutants. Studies of multiple tissue sets collected at autopsy are encouraging inasmuch as it appears these tissues will provide useful information about the pollutant burden for constructing predictive models and, in addition, provide flashback capabilities.

**77-1430.** Wasserman, M.; Tomatis, L.; Wasserman, D. (Dep. Occup. Health., Hebrew Univ.-Hadassah Med. Sch., Jerusalem, Israel). **Storage map of organochlorine compounds (OCC) in humans: epidemiological deductions for further monitoring.** *IN: Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution.* Commission of the European Communities, Luxembourg, 1975, p. 1053-1066. (143 references)

Living organisms carry foreign compounds which enter them through continuous cycles of activity like their own components. Some of the compounds from the environment accumulate to some extent in the animal body in a dynamic process. In the framework of a joint program of WHO-

International Agency for Research on Cancer and the Hebrew University-Hadassah Medical School, Department of Occupational Health, Jerusalem, organochlorine insecticide (OCI) storage in humans has been investigated in various populations in Africa, Asia and South America. Data obtained in these studies led to the conclusion that the age group 25-44 years stored that highest amount of OCI in both sexes for most populations. Since after the age of 45 years a change in the amount of OCI stored was observed, it is suggested that the 25-44 year age group may characterize the OCI storage level of a community and can be compared with the mean storage level of stillborns in order to assess the increase in man's OCI impregnation from his fetal life. The paper presents a map of the storage level of OCI in humans throughout the world according to data presented in literature. Suggestions for further monitoring are presented.

**77-1431.** Bittel, R.; Garnier, A.; Lacourly, G. (Serv. Protect. Sanit., Fontenay-aux-Roses, France). **Methodologie pour l'evaluation del'exposition de l'homme resultant de la contamination des aliments par les metaux lourds, etude de quelques cas concrets. [Methods for evaluating human exposure due to contamination of food by heavy metals: case studies.]** *IN: Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution.* Commission of the European Communities, Luxembourg, 1975, p. 1441-1449.

On the basis of previous research in the radioactive sphere methodology has been developed by an Association of the European Communities and the CEA. The method was developed for the purpose of evaluating quantitatively in any given situation the heavy metals ingested by man as a function of levels in the environment, diet, and transfer characteristics. It also takes into account concentrations and dilutions which may occur at the different transfer stages such as production, processing, and distribution of foodstuffs. Conversely, the same methodology can be used to determine in each case the limiting capacity of the environment. Given the complexity of the different parameters occurring during transfer processes, sensitivity studies appear to be essential in order to define which research should be given priority. In order to make the previous ideas more concrete, this methodology was applied to the transfer of the heavy metals (especially Hg, Cd, Pb, Cu and Zn) in the food chains, both in water and in the soil.

**77-1432.** Piva, C.; Efthymiou, M. L.; Fournier, E. (Cent. Toxicol., Hop. Fernand-Widal, Paris, France). **Etude portant sur la consommation familiale de pesticides dans les familles habitant dans des grands ensembles de la region Parisienne (methodologie). [Study of pesticide intake by families living in large apartment buildings in the Paris area (methodology).]** *IN: Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution.* Commission of the European Communities, Luxembourg, 1975, p. 1789-1794. (French)

This epidemiological study of pesticide levels is motivated by the very small number of determinations carried out among the unexposed population in France. A further aim of the study is to attempt to establish correlations between the highest blood levels and the source of the substances with intention of suggesting preventive measures to reduce the contamination. Surveys of various kinds are usually designed to determine the quantities ingested with the food, as food is certainly the most important, though not the only route of intake. Determination of the level of use of insecticides in the home may bring to light a factor enhancing contamination.

**77-1433.** Beaconsfield, P.; Borlaug, N.; Capri de Rismini, A.; Krebs, H.; Peters, R. (Royal Free Hospital, London, UK). **Internal pollution-- our first priority. A review of the studies of the Special Commission on Internal Pollution.** *IN: Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution.* Commission of the European Communities, Luxembourg, 1975, pp. 2397-2408.

The present use of chemicals was considered under four broad headings - medication, food additives and colorants, agricultural aids, and household goods. Their respective uses were related to the responsibility shared by the producers, the consumer, government regulatory agencies, and the biomedical professions. Internal pollution is brought about in three ways: by ingestion and inhalation of the products of the polluted external environment; by daily intake of chemical additives and impurities in foods; and by the large quantities of medications taken. Since the field of medication is in the control of experts it is one aspect of internal pollution that is capable of solution within the framework of present technical and economic possibilities. Pesticides, fertilizers, and other crop and livestock improvers have come into almost universal use. Concern has been expressed about the long-term risks some of these chemicals entrain. When evaluating this, and always looking to increase the benefit: risk ratio of such agricultural aids, it must be remembered that their use should be discussed within the context of the nutritional status of the population needing to be fed. Preservatives, packaging aids, and so forth, are the result in large measure of modern economic dictates concerning demand and supply, storage and distribution. The public needs and deserves to be better informed about what is done to the food supply, and why.

*See also* **77-1446**

**77-1434.** Munnecke, D. M. (Inst. odenbiol., Forschungsanst. Landwirtsch., D3300 Braunschweig, Germany). **Properties of an immobilized pesticide-hydrolyzing enzyme.** *Appl. Environ. Microbiol.* 33(3): 503-507; 1977. (18 references)

A bacterial enzyme(s) capable of hydrolyzing nine organophosphate insecticides was covalently bound to glass. The efficiency of this binding reaction ranged from 4 to 17%. Under continuous column operation, the immobilized enzyme(s) had an extrapolated half-life of 280 days. The specific activity of this glass-covalently bound hydrolase activity for parathion varied from 0.035 to 0.15 μmol/min per g of glass. The bound activity increased with decreasing glass particle size; however, the flow resistance also increased. Immobilized enzyme(s) kinetics were approximately 50% slower than those of the free enzyme(s), but there was no significant difference in the effect pH and temperature had on the activity of immobilized and free enzyme(s). (Author abstract by permission)

**77-1435.** Sun, Y. P.; Horng, W. H.; Hsieh, P. S.; Wang, Y. C.; Lee, S. L. (Joint Commission Rural Reconstruction, Taipei, Taiwan). **A simple method of establishing tolerances for pesticide residues in different countries.** *Arch. Environ. Contam. Toxicol.* 5(3): 279-293; 1977. (16 references)

At the early stage of using pesticides, some countries that do not have sufficient knowledge of the safety of pesticides may feel inadequate to establish tolerances for pesticide residues. Some published tolerances indicate that levels set for the same pesticides in different countries may vary from a few times to as high as 50 times for lindane. Furthermore, some of the tolerances are so low that they are not practical for agricultural uses. To solve these problems the following formula was devised and accepted in Taiwan for establishing tolerances for nine pesticides applied to several vegetables. Tolerance is determined in that ADI (acceptable daily intake), expressed in milligrams of residues per kilogram of body weight, and obtained from the correlation of U.S. tolerances and ADI values published by FAO/WHO, is multiplied by the body weight (in kg) and divided by the daily food consumption (in kg), the percent of food treated, and the percent of a pesticide used on each group of crops. With the consideration of toxicological data, properties of pesticides, safety factors, and dissipation of residues on treated crops, temporary tolerances were established in Taiwan for parathion (0.75 ppm), methyl parathion (0.75 ppm), diazinon (0.5 ppm), lindane (5 ppm), dicofol (5 ppm), malathion (5 ppm), dichlorvos (0.5 ppm), naled (1 ppm) and mevinphos (0.75 ppm) and time intervals between the last application and harvest time were set at 14, 7, 4, 3, 2, 2, 1, 1, and 1 day, respectively. Final tolerances may be established after further studies on residues on commercial fields, in food markets, and in prepared food. Using this method of establishing tolerances, the only experimental data needed are local residue dissipation rates for each pesticide on treated crops. Other data can be obtained either from basic manufacturers or from published or unpublished statistics. (Author abstract by permission)

**77-1436.** Kimbrough, R. D.; Carter, C. D.; Liddle, J. A.; Cline, R. E.; Phillips, P. E. (Cent. Dis. Contr., U. S. Publ. Health Serv., Atlanta, GA). **Epidemiology and pathology of a tetrachlorodibenzodioxin poisoning episode.** *Arch. Environ. Health* 32(2): 77-86; 1977. (31 references)

Epidemiologic and laboratory investigations were performed following an outbreak of poisoning in three riding arenas in Missouri. The outbreak was traced to spraying of the arenas for dust control with salvage oil contaminated with improperly disposed industrial wastes. The most harmful components were tetrachlorodibenzo *p*-dioxin (TCDD), trichlorophenol, and polychlorinated biphenyls. Small animals with access to the first arena sprayed were found dead over the next several weeks, and horses began displaying pathological symptoms four days after spraying. A total of 57 horses exercised in three sprayed arenas died, as well as numerous birds, cats, dogs, and mice. Children playing in the sprayed arenas also developed symptoms ranging from chloracne to hemorrhagic cystitis. Horses continued to die for almost three years after spraying of the first arena, despite removal of contaminated soil twice. The most prominent autopsy finding in the horse carcasses examined was a centrilobular liver fibrosis arising in the wall of the central veins. Findings resembled those in the chronic form of veno-occlusive disease of the liver in humans.

**77-1437.** Oehme, F. W. (Comp. Toxicol. Lab., Kansas State Univ., Manhattan, KS). **Veterinary toxicology: the epidemiology of poisonings in domestic animals.** *Clin. Toxicol.* 10(1): 1-21; 1977. (50 references)

Animals are constantly exposed to a wide variety of foreign chemicals, many of which are potentially toxic and some of which result in clinical poisonings. Pesticides are applied on or around animals for the control of insects and rodents. These chemicals may be placed in areas without regard for accessibility to household pets and domestic livestock. Insecticides, herbicides, and fungicides are routinely and haphazardly applied to animal and environmental surfaces alike with apparent disregard for differences in absorptive capability. Fortunately, newer herbicides and fungicides are relatively nonhazardous. Drugs are considered to have

therapeutic effects, but the lay and professional person's disregard for species differences and variations in recommended dosages can result in poisonings. Adverse reactions may be misnomers for errors in judgment. Failure to provide satisfactory storage facilities for animal feeds and the improper preservation and handling of feedstuffs allow the growth and development of a variety of mycotoxins. Ignorance on the part of animal owners and livestockmen can result in a number of unusual and sometimes fatal clinical syndromes. The dependence of domestic animals and livestock upon their owners for the total environment makes these animals extremely susceptible to environmental pollutants. Exposure to noxious gases, irritating and hazardous industrial materials and wastes, water contaminants, and casually discarded compounds of our own use can and frequently do result in animal illnesses and death. Persons responsible for animals may be unaware of the potential hazard or lack good judgment in the use of these chemicals. Forceful and continuing education for the safe and sensible use of all foreign compounds on and around domestic animals and livestock is needed. Persons handling and applying these materials must recognize their responsibility, not only to themselves but also to their neighbors and the animals in their care. (Author abstract by permission)

**77-1438.** Nater, J. P.; Gooskens, V. H. J. (Dep. Dermatol., State University Hospital, Groningen, The Netherlands). **Occupational dermatosis due to a soil fumigant.** *Contact Dermatitis* 2(4): 227-229; 1976. (4 references)

Three cases are reported of adverse reaction to the soil fumigant D-D, a mixture of dichloropropane and dichloropropene (containing about 1% epichlorohydrin). Following repeated application of D-D the patients, all farmers, noticed erythematous, itching eruption following direct contact with D-D solution. Patch tests with 1% D-D mixture in acetone as well as with the individual components of D-D gave positive results only in one patient. Reaction in this case was therefore interpreted as allergic contact sensitivity. Primary irritant reactions were judged to exist in the other two cases. The allergic patient also had positive patch test results with the dichloropropene component alone.

**77-1439.** Okonek, S.; Boelcke, G.; Hollmann, H. (Cent. Detox. Poison Inform., 2nd Med. Clin., Univ. Mainz, Mainz, Germany). **Therapeutic properties of haemodialysis and blood exchange transfusion in organophosphate poisoning.** *Europ. J. Intensive Care Med.* 2(1): 13-18; 1976. (39 references)

In vitro dialysis experiments were performed after addition of parathion, demeton -*S*-methyl sulfoxide, and dimethoate to human blood. A conventional dialysis system was found to be quite effective in eliminating demeton -*S*-methyl sulfoxide and dimethoate; dialysance values of 52.98 and 59.07 ml/min respectively were obtained. Parathion could not be removed by hemodialysis. Therefore the efficacy of exchange transfusion (exchanging 63% of the receiver animal's blood) for paraquat removal was examined. Only 0.06% of the injected dose of parathion was removed from the body of poisoned rats by exchange transfusion. Acetylcholinesterase activity increased briefly during the exchange transfusion and decreased gradually thereafter. Brain and muscle enzyme activity were unaffected. Thus neither of these methods seems promising for treatment of parathion poisoning.

**77-1440.** Klemmer, H. W.; Budy, A. M.; Takahashi, A.; Leitis, E.; Sato, M. (Hawaii Epidemiol. Stud. Program, Pacific Biomed Res. Ctr., University of Hawaii, Honolulu, HI 96822). **Fatalities in kittens exposed to aldrin-treated soil.** *J. Am. Vet. Med. Assoc.* 170(7): 727-729; 1977. (6 references)

A house with an elevated wooden foundation was treated for termite control by spraying aldrin on the soil, followed six days later by tent fumigation with sulfuryl fluoride. Six 6-week-old kittens were left outdoors with free access to the house foundation. On the first day after removal of the house tent the kittens developed convulsions, mydriasis, nystagmus, catarrh, tremors, and incoordination. Kittens died on days 4-18 after exposure. At necropsy all the kittens were seen to be severely dehydrated. Petechiae were found on the lungs, the liver was pale and mottled, and the eyes were clouded. Pesticide residues were determined in soil from beneath the house and in tissues from three of the kittens. Soil contained 76 ppm aldrin and 5.2 ppm dieldrin. The brain of the first kitten to die in the veterinary clinic contained aldrin at ca. 30 ppm and dieldrin at ca. 6 ppm; kidney, heart, and spleen contained aldrin at 45, 44, and 55 ppm respectively and dieldrin at 9.6, 13.0, and 14.1 ppm. Brain organochlorine levels were considered sufficient to have caused death.

**77-1441.** Beat, V. B.; Morgan, D. P. (Dep. Prevent. Med. Environ. Health, Univ. Iowa Coll. Med., Iowa City, IA 52240). **Evaluation of the hazards involved in treating cattle with pour-on organophosphate insecticides.** *J. Am. Vet. Med. Assoc.* 170(8): 812-814; 1977. (9 references)

Evidence of organophosphate absorption was sought in 18 veterinarians who regularly practiced organophosphate pour-on treatment of cattle for grub infestation. Veterinarians were asked to record their chemical contacts, note any symptoms, provide serial

blood samples in Aug. 1975-April 1976, and provide urine specimens for measurement of alkyl phosphate metabolites. Some of the veterinarians reported headache, nausea, and irritation of the face and throat during chemical applications in poorly ventilated buildings. On the average there was no depression of either plasma or RBC cholinesterase activities as a result of the season of occupational organophosphate exposure. There was a significant increase in cholinesterase values at the time of the last measurements, possibly due to a paradoxic response to prolonged low-level organophosphate absorption. Excretions of dimethylphosphate exceeding 20 μg/24 hr were seen in 2 of the 31 specimens examined for urinary alkyl phosphate; in one of these cases a 30% decline in RBC cholinesterase activity was also apparent.

**77-1442.** Rappe, C. (Dep. Org. Chem., Umea University, Umea, Sweden). **Seveso sju manader efter katastrofen. [Seveso, seven months after the disaster.]** *Kem. Tidskr.* 89(1-2): 24-26; 1977. (Swedish)

Events in the days and months following the environmental discharge of TCDD (dioxin) at Seveso, Italy are chronicled. Other accidents that have occurred during 2,4,5-trichlorophenol manufacture are also listed. Although the accident occurred on July 10, 1976, information regarding the danger of TCDD was not rapidly dispersed, and the declaration that Seveson was a contaminated area was not issued until seven days after the accident. This was one day after 14 children playing in the aerosol cloud were hospitalized.

**77-1443.** Jacobson, F. B. (Author address not given). **Food protection: residues and tolerances.** *Manuf. Confect.* 57(4): 63-65; 1977.

Tolerances for pesticide residues in processed foods are discussed in an article that forms part of a series on food protection. Although the establishment of residue levels for raw agricultural commodities does not automatically provide for residues in processed foods, the concept of "good manufacturing practice" may be employed. As long as such practices are followed and as long as the concentration of residue in processed food does not exceed the tolerance for the raw commodity, the processed food will not be classed as adulterated. However, increases in concentration of the residue can occur due to drying or other concentrating methods. Pesticides currently used in the candy and chocolate industry include methyl bromide, aluminum phosphide, cyanide, ethylene oxide, propylene oxide, chlorpyrifos, dichlorvos, and pyrethrins. Tolerances are presented for each of these, some covering residues due to exposure in food handling eseablishments and some covering residues from storage protection. Instances of detection of confectionery ingredients at the time of import and during storage or in transit have occurred. The primary reasons are improper use of pesticides on growing crops and poor surveillance of insect control procedures in warehousing and processing plants.

**77-1444.** Parkin, P. J.; McGiven, A. R.; Bailey, R. R. (Dep. Renal Med., Christchurch Hosp., Christchurch, New Zealand). **Chronic sodium monofluoroacetate (compound 1080) intoxication in a rabbiter.** *N. Z. Med. J.* 85(581): 93-96; 1977. (12 references)

A 59-year-old rabbiter with repeated exposure to SMFA (sodium monofluoracetate) presented with renal, hepatic, neurologic, and thyroid dysfunction. The most significant finding was severe renal failure, renal histology showed membrano-proliferative glomerular changes with fibrin accumulation and severe toxic changes in proximal tubular epithelial cells. These changes closely resembled those seen in rats given SMFA. Two urine samples taken two weeks after admission and analyzed for SMFA contained this compound at 1.54 mg/dl and 1.48 and 1.48 mg/dl. The patient's condition gradually resolved with symptomatic treatment (and excision of a hypertrophied prostate). The peripheral neuropathy with extrapyramidal features resolved within 6 mo. Liver abnormalities were demonstrated by enzyme tests and histological examination of the biopsy specimen.

**77-1445.** Freye, H. A. (Akad. Wiss., Berlin, DDR). **Problemanalyse der embryotoxischen, teratogenen und mutagenen Gefaehrdung des Menschen. [Problems relating to embryotoxic, teratogenic, and mutagenic risks to human health.]** *Sitzungsber. Akad. Wiss. DDR. Math. Naturwiss. Techn.* 1N: 5-21; 1977. (20 references)

The tremendous number of exogenous factors which can cause damage to the fetus can be classified as infections, physical factors, chemical factors, nutritional factors, and mechanical factors. DDT has been given particular attention because it is widespread in the biosphere, accumulates in the human body, and has been found teratogenic according to laboratory experiments. Especially under the stress of hunger DDT can be liberated from body stores and transmitted to the fetus. Mutagenic factors are far more difficult to demonstrate than fetotoxic ones, but their detection is a pressing problem. Mutagenesis has been repeatedly demonstrated for the chemical classes of acroleins, aflatoxins, alkyl metal compounds, azo dyes, carbamates, hydrazines, ozone, nucleic acid antimetabolites, and organophosphates. Substances which are chemically related to known mutagens should receive the first priority for testing.

**77-1446.** Davies, J. E. (Univ. Miami Sch. Med., Miami, FL). **Epidemiologic studies of DDT and dieldrin residues and their relationship to human carcinogenesis.** ***IN:*** *Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution.* Commission of the European Communities, Luxembourg, 1975, p. 695-702. (7 references)

Serologic and adipose surveys of the human DDT residues in the population of South Florida exhibited significant demographic characteristics in both tissues. Total DDT residues were higher in blacks than whites, and were age and social class dependent, higher residues being found in the less affluent in both races. Similarly, geographic distribution differences have been identified. These demographic and geographic distribution frequencies emphasize the significant contribution of non-dietary sources of DDT in incidental DDT pollution. The identification of clustering within homes and environmental studies in a Bahamian island population implicated household dust as a major contributant to this type of pollution in tropical areas. When adipose surveys were stratified for these differences no significant differences in total DDT adipose residue were observed in autopsy and biopsy comparisons from 122 cancer cases when compared with race, sex and socio-economically matched controls. Similarly, in separate comparisons of these residues in 24 lung cancers, 14 gastrointestinal cancers, 29 breast cancers, and 15 generalized metastatic carcinomas, no significant differences were observed. The complexities of case-control residue studies are described. Demographic relationships of this type were not found for dieldrin.

**77-1447.** Oloffs, P. C.; Hardwick, D. F. (Dep. Biol. Sci., Simon Fraser Univ., Burnaby, B. C., Canada). **Hepatic damage and organochlorine residue concentrations in body tissues.** ***IN:*** *Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution.* Commission of the European Communities, Luxembourg, 1975, p. 961-965. (3 references)

Liver specimens taken from patients with hepatic cirrhosis contained significantly higher concentrations of DDT, but significantly lower concentrations of heptachlor epoxide than specimens from controls. Concentrations of dieldrin were not significantly different. No significant differences were found between cirrhotics and controls in the concentrations of any residues in brain and adipose tissues. None of the specimens contained detectable amounts of aldrin, heptachlor, lindane, or the alpha or gamma isomers of chlordane. There was a highly significant association between lipid contents and residue concentrations in livers. Cirrhotic livers with severe fatty infiltration, determined by histopathological examination, and confirmed analytically, contained significantly higher amounts of DDT and heptachlor epoxide than did those with minimal or no fatty changes.

**77-1448.** Dennis, C. A. R. (Prairie Inst. Environ. Health, Regina, Saskatchewan, Canada). **The use of Canadian medicare data in defining health effects of the environment on man.** ***IN:*** *Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution.* Commission of the European Communities, Luxembourg, 1975, p. 1543-1548.

The Canadian medicare data base, comprised of provincial components, is composed of the number, cost and diagnostic code of the physician services that each resident receives. Analysis of such computerized information allows comparison to be made between populations with regard to the number and cost of physician services for defined diagnostic codes or code groupings. Saskatchewan medicare data has been used to define the effects of the agricultural environment on health with particular reference to accidents and the effects of agricultural machinery, grain dust and agricultural chemicals. Medicare data was used to identify 112 persons treated for methomyl intoxication in 1971; subsequent interview of the physician and patient allowed for the evaluation of diagnosis and insecticide-handling practices. The main limitation to the use of medicare data stems from the fact that health insurance agencies may have no defined responsibility for the preventive aspects of health care and therefore no commitment to make full use of their data to define health effects of the environment on man. The use that can be made of medicare data to define the effects of environment on health appears initially to be dependent not only on the ability to precisely define a particular health hazard and the resulting health effects, but also on the uniqueness of the health effect. Medicare data has special value where precise definitions cannot be formulated but where the data can still be used to support, or not, a hypothesis that a particular environmental hazard contributes to the incidence of a health effect in a population.

**77-1449.** Waldbott, G. L. (Warren, MI). **Illness due to environmental pollutants in a physician's practice.** ***IN:*** *Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of environmental Pollution.* Commission of the European Communities, Luxembourg, 1975, p. 1575-1577. (1 reference)

Practicing physicians are frequently confronted with illness due to environmental pollution, but many lack the diagnostic tools for its recognition. Relatively little information is available to the

physician on the clinical aspect of such disease in contrast to an abundance of literature pertaining to the biochemical and epidemiological approach. This paper attempts to bridge this gap. Data have been gleaned from acute pollution eposides and from chronic low-grade exposure to environmental pollutants which leads to slowly progressive illness. The patient's history, physical and laboratory findings are correlated with available environmental data and elucidated by brief case reports. The modus operandi of respiratory pollutants is discussed in distinction to systemic airborne poisons which enter the system via the gastrointestinal tract. The target organs of the major environmental pollutants are presented diagramatically and the diagnostic features of illness due to air pollution are tabulated.

**77-1450.** Tomatis, L. (Inst. Ag. Res. Cancer, Lyon, France). **The carcinogenic risk for man of environmental chemicals.4 IN:** *Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution.* Commission of the European Communities, Luxembourg, 1975, p. 2317-2329. (34 references)

Environmental factors may act directly on individuals exposed and may affect pregnant women and therefore reveal an effect on a subsequent generation. A direct effect of environmental factors in producing cancer in man has been shown by: (1) the unequivocal evidence of the chemical origin of occupational cancer, as in the cases of urinary bladder tumors in workers exposed to aromatic amines, lung cancers in workers exposed to bis(chloromethyl)ether, etc.; (2) the well-documented cases of iatrogenic cancers; (3) the positive correlation between cigarette smoking and lung cancer; (4) the different cancer incidence in urban and rural populations and the possible role of air pollution; and (5) the results of studies in migrants showing that for some cancers migrants acquire incidence similar to those of the host countries. Results obtained in experimental carcinogenesis are in keeping with a direct carcinogenic effect of chemicals. The evidence that exposure of pregnant women to a carcinogen may result in an increased risk of cancer in the progeny has been provided by the reports on the incidences of vaginal cancer in daughters of women exposed to stilbestrol during pregnancy. The role of prenatal exposure in determining cancer risks in the progeny is fully documented in experimental carcinogenesis. The possibilities of removing or preventing carcinogenic hazards to man in the environment will be discussed.

**77-1451.** Epstein, S. S. (Environ. Health Progr., Case Western Reserve Univ., Cleveland, OH). **Assessment of the influences of environmental pollutants on cancer and other chronic diseases.** ***IN:*** *Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution.* Commission of the European Communities, Luxembourg, 1975, p. 2367-2386. (19 references)

There is now little doubt that many chronic diseases, hitherto regarded as spontaneous, particularly cancer, are caused by environmental pollutants. This realization is heightened by the exponential increase in exposure of the general population to currently used and new synthetic chemicals - and their degradation products in air, water and soil - which, in general, are inadequately characterized toxicologically and ecologically. These considerations apply with even greater emphasis to relatively uncontrolled occupational exposure to a wide range of known chemical carcinogens, in addition to thousands of other toxicologically uncharacterized or inadequately characterized synthetic chemicals. Current toxicological techniques are relatively insensitive and limited in their ability to detect toxic agents, particularly carcinogens, teratogens, and mutagens, individually and in various combinations or mixtures realistically reflecting low or ambient levels and patterns of environmental exposure. Similarly, it is generally considered that epidemiological techniques are unlikely to detect environmental pollutants, such as weak carcinogens, unless there are sharp differentials in exposure of the general population, as with cigarette smoking. For widely dispersed agents to which the population-at-large is generally and ubiquitously exposed, such as unintentional or accidental food additives, human experience is unlikely to provide any meaningful indication of safety or hazard. Similarly, it is not possible to develop valid inferences concerning the safety of occupational exposure to particular chemicals or mixtures of chemicals in the absence of an adequate population sample which has been adequately followed up for several decades. Scientific considerations apart, there are critical deficiencies in legislative and regulatory approaches to environmental pollutants, including conflicts of interest in general and evaluation of data, restrictions on open access to data, and lack of qualified representation of a wide range of concerned viewpoints and interest in decision making processes.

**77-1452.** Santolucito, J. A. (Environ. Protect. Ag., Research Triangle Park, NC). **The use of quantitative EEG for detecting low-level prolonged exposure to pesticides.** *Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution,* Commission of the European Communities, Luxembourg, 1975, p. 2387-2394. (10 references)

Data were obtained from 15 minutes of anesthetized sleep EEG using three scalp electrodes positioned at mid-frontal, right and left occipito-

parietal regions. Interval histograms, zero potential crossover (ZPC) rate, and right-left hemisphere correspondence were obtained using computer-assisted methods. A shift toward higher frequencies, increased ZPC rate, and an increase in the coefficient of variation of ZPC were most pronounced in carbaryl, 2,4-D, and toxaphene-treated animals. Bilateral correspondence tended to be increased by all pesticides tested. In order to facilitate application of this methodology to occupationally exposed humans, a portable EEG was designed and constructed. The instrument is completely battery operated and will accept three channels of EEG for recording on tape cassette. The attending physician can obtain recordings before, during, and following an agricultural season, in the field, with minimal interruption of work schedules. The tape cassettes are mailed to the laboratory and played back through a physiological data acquisition unit for paper write-out and computer processing. The instrument will be described and preliminary findings will be discussed.

**77-1453.** Off. Water Planning and Standards (Environ. Protect. Ag., Washington, DC). **Criteria documents for aldrin/dieldrin.** *Natl. Tech. Inform. Serv.* PB-254,012, 1976, 93 p.

The document summarizes the physical/chemical properties, toxicological information and environmental fate and effects of aldrin/dieldrin, with emphasis on aquatic behavior. From these data, criteria are developed for the protection of aquatic life and for human exposure. Portions of this document are not fully legible. (Author abstract by permission)

**77-1454.** Off. Water Planning and Standards (Environ. Protect. Ag., Washington, DC). **Criteria document for DDT (DDD, DDE).** *Natl. Tech. Inform. Serv.* PB-254,014, 1976, 150 p.

The document summarizes the physical/chemical properties, toxicological information and environmental fate and effects of DDT, with emphasis on aquatic behavior. From these data criteria are developed for protection of aquatic organisms and for human exposure. Portions of this document are not fully legible. (Author abstract by permission)

**77-1455.** Off. Water Planning and Standards (Environ. Protect. Ag., Washington, DC). **Criteria document for endrin.** *Natl. Tech. Inform. Serv.* PB-254,016, 1976, 129 p.

The document summarizes the physical/chemical properties, toxicological information and environmental fate and effects of endrin, with emphasis on aquatic behavior. From these data a criterion for the protection of aquatic life and human health is developed. Portions of this document are not fully legible. (Author abstract by permission)

**77-1456.** Wolfe, H. R. (Off. Pesticide Programs, Environ. Protect. Ag., Washington, DC). **Chemical safety -- pesticides.** *Natl. Tech. Inform. Serv.* PB-254,272, 1974, 24 p.

People who become involved in activities requiring exposure to pesticides should be aware of the potential hazards involved as a result of absorption of toxic compounds. If a person is knowledgeable about such hazards and understands the importance of taking proper precautions, he can do much to insure the safety of himself and others. Although illnesses resulting from over-exposure to toxic compounds do occur among applicators and other workers, most are a result of carelessness or accident. Experience has shown that if proper precautionary measures are observed and directions on the pesticide label are followed, even the more toxic compounds can be used safely. Exposure to less toxic compounds should not be ignored. Prepared in cooperation with Colorado State Univ., Fort Collins. Inst. of Rural Environmental Health. Proceedings of the Annual Conference of Environmental Chemicals - Human and Animal Health (3rd). Held at Fort Collins, Colorado, July 15-19, 1974. (Author abstract by permission)

**77-1457.** Office of Toxic Substances (Environ. Protect. Ag., Washington, DC). **Selected aspects of the control of toxic substances (a compilation of speeches), by the members of the staff of the Office of Toxic Substances.** *Natl. Tech. Inform. Serv.* PB-254,417, 1976, 147 p.

Topics covered include: chemical and environmental concerns; pesticides and the Toxic Substances Control Act; address to the conference on the environmental impact of water chlorination; an approach to the control of toxic substances; environmental aspects of chemical use in printing operations; chemicals and the environment; program of the Office of Toxic Substances in relation to microcosm methodology development and the OTS ecological effects program; environmental aspects of chemical use in well-drilling operations; risk analysis and setting standards for chemical carcinogens; environmental aspects of chemical use in rubber processing operations; and role of the Environmental Protection Agency in establishing standards on trace contaminants. (Author abstract by permission)

**77-1458.** Matanoski, G.; Landau, E.; Elliott, E. (Amer. Pub. Health Assoc., Washington, DC). **Epidemiology studies. Task 1, phase 1: Pilot study of cancer mortality near an arsenical pesticide plant in**

**Baltimore.** *Natl. Tech. Inform. Serv.* PB-255,019, 1976, 25 p.

The present study was a preliminary attempt to determine the feasibility of using cancer mortality data to indicate the carcinogenic effects of possible arsenic exposure in the environment. The four census tracts of which fifty percent of the areas lay within a 3/4 mile radius of an arsenical-producing insecticide plant were matched by such demographic characteristics as age, race, sex, and socioeconomic status with all other similar tracts in Baltimore City. The matching tracts were then subdivided according to suspected differences in exposure to environmental pollution. The lung cancer mortality was higher for the combined tracts adjacent to the plant as compared to the control tracts. The lung cancer mortality for the tract in which the plant was located was three to four times higher than in control tracts, a difference which was significant. The data also support a northerly gradient in rates with increasing distance from the plant. (Author abstract by permission)

**77-1459.** Office of the Administrator (Environ. Protect. Ag., Washington, DC). **Index of EPA legal authority. Statutes and legislative history, executive orders, regulations.** *Natl. Tech. Inform. Serv.* PB-255-142, 1974, 283 p.

The purpose of this Index is to provide a legally cited listing of all the statutes with their legislative histories, executive orders, regulations, and guidelines and reports, that are currently applicable to the U.S. Environmental Protection Agency. It is a quick reference source as well as providing the citations to enable one to obtain the actual material. The Index is divided into seven major divisions: General, Air, Water, Solid Waste, Pesticides, Radiation, and Noise. Each major division is subdivided into groupings of Statutes and legislative history, Executive orders, Regulations, and Guidelines and reports. (Author abstract by permission)

**77-1460.** Region VIII (Environ. Protect. Ag., Denver, CO). **EPA's environmental programs: a planning coordination package for Federal land managing agencies.** *Natl. Tech. Inform. Serv.* PB-255,263, 1975, 54 p.

The discussion of Federal environmental statutes is intended to guide planners of Federal agencies and other interested individuals through some of the land use aspects of these laws, point out the planning constraints they impose, and draw attention to ongoing Federal, state, and local planning activities that may affect the programs of other Federal agencies. Because of the breadth of the materials covered and the rapid pace of events in this field, the package has been designed to provide a brief introduction to certain planning and land use aspects of several complex pieces of environmental legislation together with sources of current, detailed information that will be useful in carrying out the programs of various agencies in harmony with EPA's legal mandates. (Author abstract by permission)

**77-1461.** Natl. Enforcement Invest. Ctr. (Denver, CO). **South Dakota toxaphene use study, June-September 1975.** *Natl. Tech. Inform. Serv.* PB-255,597, 1975, 22 p.

A field investigation in Brown and Spink Counties, South Dakota was conducted. The principal objectives of the study were to: (1) Assess the short-term effects of toxaphene on the ecosystem adjacent to fields being sprayed to control cutworms; and (2) determine the efficacy of using toxaphene to control cutworms in young sunflower plants without becoming an environmental hazard. (Author abstract by permission)

**77-1462.** Aquatic Biol. Sect. (Illinois Natur. Hist. Survey, Urbana, IL). **Chemicals used to control fish ang aquatic plants in Illinois.** *Natl. Tech. Inform. Serv.* PB-255,897, 1975, 89 p.

The use of pesticides is presently the most efficient and practical means for eliminating undesirable fish. Depending on the limnology of the water body and type of eradication desired, the use of toxicants may be the only effective and practical means of controlling or sampling fish pollutions. Therefore, the elimination of toxicant use would be undesirable. Since toxicants have such an important role in fish control, it is necessary to evaluate their use. The following criteria have been assembled to make such an evaluation. A desirable agent would have all or most of these characteristics: toxicity selective only for the target species, efficiency over a wide range of water quality, rapid natural or chemical detoxification, effective after short exposure time, non-repellent to target species, irreversible action, easy application, non-hazardous, and economical. (Author abstract by permission)

**77-1463.** Fuller, W. H. (Dep. Soils Water Eng., Arizona Univ., Tucson, AZ). **Residual management by land disposal. Proceedings of the hazardous waste research symposium held at Tucson, Arizona on February 2, 3, and 4, 1976.** *Natl. Tech. Inform. Serv.* PB-256,768, 1976, 280 p.

A research symposium was held to exchange recent information on land disposal of municipal and hazardous wastes. Papers were presented and compiled into a report on the following topics: (1) Case studies of actual and potential environmental impact from land disposal of hazardous wastes; (2) Technol-

ogy of preventing adverse environmental impact; (3) Selection of disposal sites to minimize adverse impact; (4) Ameliorating damages at existing disposal sites and suggested modification of future sites and wastestreams; (5) Identification of pollution potential of selected industrial solid wastes, and (6) Special disposal problems. (Author abstract by permission)

**77-1464.** Fitzhugh, O. G.; Fairchild, H. E. (Criteria Eval. Div., Environ. Protect. Ag., Washington, DC). **Pesticidal aspects of chlordane in relation to man and the environment.** *Natl. Tech. Inform. Serv.* PB-257,107, 1976, 114 p.

The review evaluates scientific data in the areas of fish, wildlife, distribution in the environment, residues in crops and food items, and toxicology and epidemiology. This review summarizes rather than interprets scientific data studied during the process of reviewing chlordane. It is not intended that this report correlate data from different sources. The review also does not present opinions on contradictory findings. The review of chlordane covers all uses of the pesticide in the United States and should be applicable to future needs in the Agency. (Author abstract by permission)

**77-1465.** Bartleson, F. D.; Harrison, D. D.; Miller, C. I. (Air Force Armament Lab., Eglin AFB, FL). **A survey of trees on a herbicide treated test area, Eglin AFB, Florida.** *Natl. Tech. Inform. Serv.* AD-B0002,567, 1974, 41 p.

A survey was made of trees growing on the 1 square mile instrumented test grid of Test Area C-52A, Eglin Air Force Base Reservation, Florida. This area had previously been subjected to land clearing operations and heavy herbicide deposition. The active herbicide ingredients have disappeared, but there were still many large areas devoid of young trees. The absence of trees in these areas was apparently due to heavy herbicide deposition which prevented regeneration from roots of previous trees and the lack of soil moisture, which has retarded the germination of seeds. The lack of soil moisture was principally attributed to the previous removal of ground cover and consequent drying effects of the wind. The areas with the most trees were generally outside of the herbicide spray aircraft primary flightpaths and were in more moist soil. Young oak trees, sprouting from roots, were predominant on the test area and were in contrast to the surrounding pine forest. Additional studies were recommended to evaluate future vegetative succession. (Author abstract by permission)

*See also* **1526** **77-1530**

**77-1466.** Diamant, B.; Patkar, S. A. (Dep. Pharmacol., Univ. Copenhagen, Copenhagen, Denmark). **On the inhibitory action of DFP and PMSF on histamine release from isolated rat mast cells.** *Ag. Actions* 7(1): 110-111; 1977. (9 references)

Previous findings have indicated that antigen stimulation of mast cells is followed by activation of an esterase by a calcium-dependent mechanism, then followed by an energy-requiring step, a second calcium-requiring step, and a cyclic AMP-inhibitable step in the release of histamine SRS-A. As an alternative explanation of this process, the possible inhibitory action of DFP and PMSF on the energy metabolism of rat mast cells was examined. The mast cells were incubated under both anaerobic and aerobic conditions. DFP and PMSF as well as the reference compound, 2-deoxyglucose, inhibited histamine release parallel to the inhibition of lactate production. Under aerobic conditions 2-deoxyglucose at 10 m*M* did not influence histamine release, while DFP and PMSF were inhibitory at 5-10 m*M* and 1-2 m*M* respectively. Thus their inhibitory action under aerobic conditions might be attributed to their inhibition of aerobic glycolysis at an additional critical enzymatic step. They inhibit the metabolic energy production necessary for the coupling of stimulation to secretion in the rat mast cells.

**77-1467.** Hasegawa, G.; Gorin, A. B. (Dep. Intern. Med., Univ. California, Davis, CA). **Clearance of paraquat from plasma and lung lymph in sheep.** *Am. Rev. Resp. Dis.* 115(4): 220; 1977.

The clearance of paraquat from blood and pulmonary lymph was studied in 6 sheep. Lung lymph was obtained by chronic cannulation of the caudal mediastinal lymph node efferent duct. Heparinized plasma and lymph samples were assayed for paraquat spectrophotometrically, after reaction with Na+dithionite (S. Yuen et al., *Analyst*, 92: 375-381). The minimum concentration detectable by this method was .5 μg/ml. Animals received Ortho Paraquat Cl (29% paraquat-HCl; Chevron Chem. Co., Richmond, CA), 4-5 mg/kg body weight, IP, or as an IV infusion over 60 minutes. This dose achieved peak plasma levels of 9-12 μg/ml. Peak concentrations in lymph of 11-16 μg/ml occurred an average of 30 minutes after the peak plasma level in the same animal. No paraquat was detectable in plasma 8 hours after administration, but levels were measurable in lung lymph up to 23 hours following IP injection. In all studies lymph concentration of paraquat exceeded plasma concentration within 30 minutes of plasma levels peaking out, and remained higher thereafter. Three of the 6 sheep given this dose died within 48 hours of paraquat administration. Post-mortem examination revealed congested, airless lungs. All others survived more than 7 days (1 animal died a respiratory death on day 8). Results indicate that paraquat is extremely toxic to sheep. The finding of lung lymph/plasma [paraquat] ratios of $> 1$ is further evidence that a mechanism exists by which paraquat is concentrated in the lung. Detection of paraquat in the lung lymph many hours after it is no longer measurable in plasma is compatible with other evidence that paraquat is slowly released by dying pneumocytes.

**77-1468.** Montgomery, M. R. (Pulmonary Dis. Sec., VA Hosp., Minneapolis, MN 55455). **Oxidant-induced lung damage: correlation with activated oxygen and superoxide dismutase levels.** *Am. Rev. Resp. Dis.* 115(4): 231; 1977.

Parenteral exposure to the herbicide paraquat (Pq) results in specific pulmonary toxicity characterized by edema, infiltration and fibrosis. This toxicity of Pq has been suggested to be related to its ability to form a free radical *in vivo* and then to transfer this extra electron to $O_2$ to form superoxide, $O_2$-. Superoxide is then catabolized via the cellular enzyme superoxide dismutase (SOD) to form peroxide which is then further degraded to $H_2O$ and $O_2$ via catalase. The generation of $O_2$-by lung microsomes (preparations of endoplasmic reticulum) is doubled *in vitro* by as little as 1 m*M* Pq. Furthermore, low concentrations of Pq resulted in a 3-fold stimulation of $H_2O_2$ production by lung preparations. Biochemical expression of specific pulmonary damage is evidenced by a 50% decrease in the pulmonary microsomal metabolism of a drug, benzphetamine, at 4 and 7 days after a dose (20 mg/kg, i.p.) of Pq. No inhibition was seen in the hepatic microsomal metabolism of this compound. The microsomal activities of the enzymes catalase and SOD were examined to establish the ability of this subcellular compartment to detoxify $H_2O_2$ and $O_2$-, respectively. Significant levels of catalase activity were found in microsomes prepared from liver, kidney and lung, indicating the ability of these preparations to degrade the formed $H_2O_2$. However, only liver and kidney demonstrated detectable levels of SOD activity; lung microsomes were devoid of this detoxifying enzymic activity. These data would suggest that compounds such as Pq that are known to have oxidant-related pulmonary specificity may generate their cellular damage via an activated oxygen species which cannot be immediately degraded at its site of formation in the lung.

**77-1469.** O'Neill, J. J.; Engelbrecht, F. M.; Wilson, A. G. E. (Natl. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **Paraquat uptake and distribution by rat lungs.** *Am. Rev. Resp. Dis.* 115(4): 234; 1977.

Paraquat (PQ) was injected intraperitoneally (27 mg/kg) into male Sprague Dawley rats, the lungs

removed 24, 48, and 72 hours later, slices prepared, and oxygen consumption and the oxidation of 1-$^{14}$C and 6-$^{14}$C glucose determined. The oxygen consumption was found to vary by as much as 45% in slices taken from different lungs and by 15% in different slices from the same lung. There was also a 30% variation in glucose oxidation when estimated in slices from different animals, whereas the variation between controls was less than 6%. Oxidation of 1-$^{14}$C-glucose was dependent on the PQ concentration in the medium, therefore, one possible explanation for the differing results is that varying concentrations of PQ were present in the lung slices studied. Analysis of the distribution of $^{14}$C-PQ revealed that there was as much as a 2 fold variation in PQ concentration in different parts of the same lung. Kinetic analysis of PQ uptake into isolated perfused rat lungs also revealed considerable variation in the amount of PQ accumulated by comparable lungs.

**77-1470.** Block, E. R.; Wasserman, B.; Rostand, R.; Hood, C. T. (Univ. Florida Coll. Med., Gainesville, FL). **Prevention of acute paraquat toxicity in rats by superoxide dismutase.** *Am. Rev. Resp. Dis.* 115(4): 306; 1977.

Paraquat is a widely used herbicide which causes oxidant lung injury in man characterized by progressive parenchymal damage that may lead to fatal respiratory failure. The precise mechanism of this injury is not known but is related to the cyclic oxidation and reduction of paraquat in cells with resultant production of free radicals and/or reactive species of $O_2$. In this study, SOD, an enzyme that catalyzes the dismutation of superoxide anion to less toxic forms, reduced glutathione (GSH; a major biologic antioxidant), and *d*-propranolol (PROP; a beta adrenergic blocker which inhibits accumulation of paraquat by rat lungs in vitro) were evaluated for ability to protect against acute paraquat toxicity. Rats maintained at room air were given 50 mg/kg paraquat dichloride in a single ip injection 60 min prior to receiving either 2, 10, or 20 mg/kg/day SOD, 3.5, 7, or 14 mmol/kg/day GSH, 1 or 10 mg/kg/day PROP, or an equal volume of normal saline ip in divided doses for 3 days. SOD both prolonged and increased survival at all 3 dosages studied. Only 22% of 90 saline controls survived 14 days compared to 56% ($p > 0.03$, n 18), 50% ($p > 0.04$, n 18), and 44% ($p > 0.05$, n 18) survival respectively among the 3 SOD treated groups.

**77-1471.** Krieg, Th.; Lissner, R.; Bolsen, K.; Goerz, G.; Ullrich, V. (Hautklin. Duesseldorf Biochem. Inst., Homburg (Saar), Germany). ***O*-dealkylation activity in rat liver following application of hexachlorobenzene.** *Arch. Derm. Res.* 258(1): 93; 1977. (2 references)

In man and some animals HCB (hexachlorobenzene) causes a hepatic porphyria-like porphyria cutanea tarda. Treatment of rats with HCB induces drug metabolizing enzymes within a few days and an elevated excretion of porphyrins after 60 days. Female rats were fed continuously with a HCB (0.05%) containing diet. The cytochrome P-450 activity was measured by the method of Ullrich and Weber, *O*-Dealkylation of 7-ethoxycumarine. The inhibitors THF, metyrapone and naphthoflavone were used to differentiate the various types of cytochrome excretion of total porphyrins porphobilinogen (PBG) and 5-amino-levulinic acid was estimated. After 6 days of HCB feeding increased cytochrome P 450 activity was seen in the liver, whereas the excretion of porphyrins and precursors remained unchanged. After 10 days of HCB application we found a marked increase in the *O*-dealkylation activity. Km-value 5.5 x $10^{-5}$m, and an inhibition of the enzyme activity by naphthoflavone. In comparison with other inducers phenobarbital and benzpyrene, the induction by HCB is due to a different pattern of inhibition. After 60 days of HCB application there was an increase in the activity of cytochrome P 450 by about 40 times in comparison to controls. With Km-value $10^{-5}$ naphthoflavone produced a marked inhibition in contrast to THF and metyrapone; maximum of CO-binding spectrum 450 nm. The activity of cytochrome P 450 shows two maxima: on the 20th and on the 60th day of the HCB application. These findings demonstrate an induction of a special type of cytochrome P 450 by HCB in rat liver. The relationship between the cytochrome P 450 induction and the manifestation of the porphyria are discussed.

**77-1472.** Walker, E. M., Jr.; Gale, G. R.; Atkins, L. M.; Gadsden, R. H. (Dep. Pathol., Med. Univ. South Carolina, Charleston, SC 29403). **Some effects of dieldrin and mirex on Ehrlich ascites tumor cells in vivo and in vitro.** *Arch. Environ. Contam. Toxicol.* 5(3): 333-341; 1977. (9 references)

The effects of dieldrin and mirex on Ehrlich ascites tumor cells were assessed, using certain *in vivo* (in mice) and *in vitro* measurements. Mirex retarded the development of Ehrlich ascites tumor *in vivo*, but dieldrin did not. Effects of dieldrin on *de novo* RNA purine synthesis from formate *in vivo* were slight, while mirex inhibited the synthesis of both RNA purines. Dieldrin inhibited in *in vitro* incorporation of thymidine, uridine, and L-leucine into DNA, RNA, and protein, respectively, but mirex was virtually without effect. (Author abstract by permission)

**77-1473.** Schimmel, S. C.; Patric, J. M., Jr.; Forester, J. (U. S. Environ. Protect. Ag., Gulf Breeze, FL 32561). **Uptake and toxicity of toxaphene in several estuarine organisms.** *Arch. Environ. Contam. Toxicol.* 5(3): 353-367; 1977. (24 references)

The organochlorine insecticide, toxaphene, was tested in flow-through bioassays to evaluate its toxicity to estuarine organisms. The organisms tested and their respective 96-hr LC50s (based on measured concentrations) are: pink shrimp (*Penaeus duorarum*), 1.4 μg/L; grass shrimp (*Palaemonetes pugio*), 4.4 μg/L; sheepshead minnow (*Cyprinodon variegatus*), 1.1 μg/L; and pinfish (*Lagodon rhomboides*), 0.5 μg/L. Toxaphene concentration estimated to reduce shell deposition in American oysters (*Crassostrea virginica*) by 50% (EC50) was 16 μg/L. Concentration factors (concentration of toxaphene in tissues divided by concentration measured in water) for fishes and oysters in 96 hr ranged from 3,100 to 20,600 and for shrimp, from 400 to 1,200. Individuals from varius ontogenetic stages of longnose killifish (*Fundulus similis*) were exposed to toxaphene for 28 days in flow-through bioassays. Toxaphene was toxic to embryos, fry, juveniles, and adult fish, but fertilization of ova in static tests was not affected by the concentrations tested (0.32 to 10 μg/L). The 28-day measured LC50s for all stages ranged from 0.9 to 1.4 μg/L. Toxaphene was accumulated in ova and other body tissues of the longnose killfish; concentration factors in ova were 1,000 to 5,500 and in whole-body tissues, 4,200 to 60,000. (Author abstract by permission)

**77-1474.** Jones, R. W.; Garland, P. B. (Dep. Biochem., Med. Sci. Inst., Univ. Dundee, Dundee, Scotland). **Sites and specificity of the reaction of bipyridylium compounds with anaerobic respiratory enzymes of *Escherichia coli*.** *Biochem. J.* 164(1): 199-211; 1977. (37 references)

The ability of the oxidized and singly reduced species of several bipyridylium cations to cross the cytoplasmic membrane of *Escherichia coli* was studied to locate the sites of reaction of the dyes with anaerobic respiratory enzymes. Benzyl viologen radical crossed the membrane rapidly, whereas the oxidized species did not. The oxidized or radical species of Methyl viologen, (paraquat) morfamquat or diquat did not rapidly cross the membrane. It was also shown that the dithionite anion does not cross the cytoplasmic membrane of *E. coli*. Diquat radical donates electrons to the nitrate reductase pathway at the periplasmic aspect of the membrane, whereas benzyl viologen radical reacted directly with nitrae reductase itself (EC 1.7.99.4) at the cytoplasmic aspect of the membrane. Thus the pathway of electron transfer in the nitrate reductase pathway is transmembranous. Formate hydrogenlyase (EC 1.2.1.2) and an uncharacterized nitrate reductase activity react with bipyridylium dyes at the periplasmic aspect of the membrane. Fumarate reductase (succinate dehydrogenase; EC 1.3.99.1) reacts with bipyridylium radicals, and formate dehydrogenase (cytochrome) (EC 1.2.2.1) with ferricyanide, at the cytoplasmic aspect of the membrane. The differing charge and membrane permeation of oxidized and radical species of bipyridylium dyes greatly complicate their use as potentiometric mediators in suspensions of cells or membrane vesicles.

**77-1475.** Watts, P.; Wilkinson, R. G. (Chem. Defence Establishment, Porton Down, Salisbury, Wiltshire, England). **The interaction of carbamates with acetylcholinesterase.** *Biochem. Pharmacol.* 26(8): 757-761; 1977. (10 references)

It has been shown that the kinetic schemes proposed by earlier workers to describe the reactions of carbamates with acetylcholinsterase are incomplete. A reaction scheme has been developed and tested by the use of methyl- and dimethylcarbamolycholines; it adequately explains the reactions observed in the carbamate-enzyme system, including the catalysis of decarbamoylation of carbamoylated acetylcholinesterase by excess carbamate. This study has been extended to include the reaction of acetylcholinesterase with more complex carbamates, pyridostigmine, physostigmine, mobam and decarbofuran. (Author abstract by permission)

**77-1476.** Mohammed, Y. S.; Mahfouz, M. M. (Dep. Biochem., Med. Res. Inst., Alexandria Univ., Alexandria, Egypt). **Inhibition of rat brain and heart monoamine oxidase by atropine.** *Biochem. Pharmacol.* 26(9): 871-874; 1977. (10 references)

Atropine sulfate was found to inhibit rat brain and heart monoamine oxidase *in vitro*. It was found to act as a competitive inhibitor. The enzyme-inhibitor dissociation constant (Ki) was found to be $7.36 \times 10^{-3}$ M and $5.5 \times 10^{-3}$ M for brain and heart monoamine oxidase, respectively. In addition, the kinetics of inhibition of rat brain and heart monoamine oxidase by atropine sulfate was also investigated. (Author abstract by permission)

**77-1477.** Suzuki, Y.; Kikuchi, H.; Kato, C.; Horiuchi, Y.; Tomita, K.; Hashimoto, Y. (Pharm. Inst., Tohoku Univ., Aobayama, Sendai, Japan). **Effect of alkyl phosphates on β-glucuronidase in rats: release of β-glucuronidase from liver microsomes into serum.** *Biochem. Pharmacol.* 26(9): 881-885; 1977. (38 references)

Injection of alkyl phosphates elicits an elevation of rat serum β-glucuronidase activity without altering levels of serum lysosomal hydrolases and cholinesterase. Among alkyl phosphates tested, di-

butyl phosphate and tributyl phosphate were much more effective and the activities increased 120- and 90-fold compared to control activity after 1 and 2 hr. respectively. Subfractionation study showed that after the injection of tributyl phosphate the increase in serum β-glucuronidase activity correlated with a depression in the activity of liver microsomal β-glucuronidase but not the lysosomal one. Density gradient subfractionation study suggested liver microsomes as the main source of increased serum β-glucuronidase. (Author abstract by permission)

**77-1478.** Ehrich, M.; Cohen, S. D. (Sec. Pharmacol. Toxicol., Sch. Pharm., Univ. Connecticut, Storrs, CT). **Effect of dichlorvos (DDVP) on mouse liver glutathione levels and lack of potentiation by methyl iodide and TOTP.** *Biochem. Pharmacol.* 26(10): 997-1000; 1977. (26 references)

DDVP (30 mg/kg, i.p.) caused 50 per cent inhibition of mouse brain cholinesterase activity and 20 per cent decrease in mouse liver GSH concentration 30 min after injection. Methyl iodide (135 mg/kg, i.p.) reduced liver GSH concentration to 50 per cent of control within one hr. However, this methyl iodide treatment did not alter the anticholinesterase action of subsequently administrated DDVP. This suggests that GSH-dependent metabolism does not represent an important detoxification mechanism in the mouse. Combined treatment with TOTP (tri-*o*-cresyl phosphate) and methyl iodide inhibited DDVP inactivation by binding and depressed liver GSH levels, yet the toxicity of subsequently administrated DDVP was not altered. Results suggest that low DDVP toxicity and lack of toxic interaction with TOTP and methyl iodide result from the rapid hydrolysis by A-esterases. (Author abstract by permission)

**77-1479.** Bend, J. R.; Miller, D. S.; Kinter, W. B.; Peakall, D. B. (Natl. Inst. Environ. Health Sci., Research Triangle Park, NC). **DDE-Induced microsomal mixed-function oxidases in the puffin (*Fratercula arctica*).** *Biochem. Pharmacol.* 26(10): 1000-1001; 1977. (14 references)

Immature (40-day-old) puffins were dosed orally by intubation with DDE dissolved in corn oil at an amount selected to approximate 50 ppm in diet for 16-21 days before sacrifice. Birds were maintained in artificial burrows until the normal prefledging starvation phase, then brought to the laboratory and sacrificed for analysis. Liver DDE levels averaged 2037 ppm (dry weight) in treated birds compared to 4.9 ppm in controls. The aniline hydroxylase and benzphetamine demethylase levels were significantly increased, while the yield of microsomal protein was not significantly altered. Liver weight was not significantly increased. The mobilization of tissue DDE stores by prefledging starvation was sufficient to cause toxic manifestations in the young puffins. This is apparently the first observation of microsomal enzyme induction by DDE in a sea bird.

**77-1480.** Paulov, S. (Dep. Gen. Zool. Anim. Physiol., Fac. Sci., Komenski Univ., Bratislava, Czechoslovakia). **Ucinky herbicidu gramoxone S (paraquat dichlorid) na vyvoj a telove bielkoviny obojzivelnikov (*Rana temporaria* L.)** [**Effect of paraquat on the development and body proteins of amphibia, (*Rana temporaria* L.)**] *Biologia (Bratislava)* 32(2): 127-131; 1977. (8 references) (Czech)

The effects of the commercial herbicide Gramoxone S (containing 20% of the active ingredient paraquat dichloride) were examined on the development and body proteins of tadpoles and adult *Rana temporaria*. Tadpoles or frogs were maintained in 5-liter aquaria filled with water containing paraquat at 1-250 ppm. Proteins were examined from skin, blood, and liver of treated and untreated animals. Marked effects on development were recorded, evaluated as comprising a relatively strong toxic effect, and pronounced quantitative changes were seen in the tissue proteins.

**77-1481.** Roslycky, E. B. (Res. Inst., Agric. Canada, London, Ontario, Canada N6A 5B7). **Response of soil microbiota to selected herbicide treatments.** *Can. J. Microbiol.* 23(4): 426-433; 1977. (23 references)

Recommended concentrations of paraquat alone and its combination with each of linuron, diuron, atrazine, simazine, and simazine plus diuron exerted little effect on total populations of bacteria, actinomycetes, and fungi in Fox sandy loam under laboratory and simulated field conditions in 66 and 77 days, respectively. Respiration of the total microbiota in soil suspension was affected by the combinations as well as individual herbicides in various concentrations. Yet, the inhibition of the $O_2$ uptake by any of these herbicides, including some extreme concentrations, was not permanent, indicating adaptation or suppression of specific organisms. Only linuron in concentrations up to 20 μg/ml stimulated respiration of the soil. (Author abstract by permission)

**77-1482.** Frank, R.; Sirons, G. J.; Paik, N. J.; Valk, M. (Provincial Pestic. Residue Testing Lab., Ontario Min. Agric. Food, Guelph, Ontario, N1G 2W1). **Fate of propachlor applied to onions and organic soils.** *Can. J. Plant Sci.* 57(2): 473-477; 1977. (7 references)

Propachlor (2-chloro-*N*-isopropylacetanilide) was applied to an organic soil in 1972 and 1975, and

to onions (*Allium cepa* L.) in 1974 and 1975 as pre- and postemergence treatments. Onions planted in May were harvested in September and analyzed in January. Upon analysis organic soil and onions did not contain residues of free propachlor of free *N*-isopropylaniline but upon hydrolysis *N*-isopropylaniline was recovered. In organic soil, residues of this conjugated metabolic increased in onion tissues as the rate of application of propachlor was increased and as the application was made later in the stage of the onion. (Author abstract by permission)

**77-1483.** Declume, C.; Derache, R. (Groupe Rech. Toxicol. Aliment. Boissons. Univ. Paul Sabatier, Toulouse, France). **Passage placentaire d'un carbamate anticholinesterasique a activite insecticide: le carbaryl. [Placental transfer of an anticholinesterase carbamate insecticide, carbaryl.]** *Chemosphere* 6(2/3): 141-146; 1977. (15 references) (French)

Previous studies indicated that carbaryl very effectively passes through the human skin. The placental transfer of methyl-$^{14}$C labeled carbaryl was examined following oral administration on the 18th day of pregnancy in the rat. At 1-96 hr after administration $^{14}$C-carbaryl was recovered from the principal organs of the mother as well as from the placenta and the fetus. After 1 hr 0.03% of the administered radioactivity was recovered from the fetus, and after 96 hr 0.3% was present in the fetus. The fetus continued to grow during the 6 days of the experiment. The placenta-fetus system was capable of accumulating $^{14}$C-carbaryl from the blood, while passage into the maternal brain was rather slow; brain tissue concentrations were far lower than blood carbaryl concentrations throughout the experiment. Levels of $^{14}$C-carbaryl in other tissues were also higher than those in blood. $^{14}$C-Carbaryl activity in the fetus was protein-bound, but no more definite information could be gained about the nature of the binding.

**77-1484.** Egyed, M. N.; Schlosberg, A.; Malkinson, M.; Eilat, A. (Dep. Toxicol., Kimron Vet. Inst., Beit Dagan, Israel). **Some considerations in the treatment of diazinon poisoned goslings.** *Clin. Toxicol.* 9(2): 245-249; 1976. (9 references)

An outbreak of diazinon poisoning in goslings prompted investigations into its toxicity and antidotes in this species. Important criteria for antidotes in diazinon poisoned goslings include easy and speedy administration corresponding to the rapidity of action of organophosphate in geese, the possibility of single-dose administration because of the large numbers of birds to be handled, and lasting therapeutic action. Atropine was found to be physiologically inactive at enormous doses in both normal and diazinon poisoned goslings. Obidoxime and pralidoxime were examined as antidotes; obidoxime was ineffective except at toxic levels, whereas pralidoxime at 100 mg/kg caused startling clinical recovery.

**77-1485.** Brimblecombe, R. W. (Res. Inst., Smith Kline and French Labs. Inc., Welwyn Garden City, Hertfordshire, England). **Behavioral toxicology in the evaluation of food safety.** *Clin. Toxicol.* 9(5): 731-743; 1976. (4 references)

A suggestion is made that some techniques used by neuropharmacologists and psychopharmacologists for studying psychotropic drugs may be useful in toxicology for detecting possible earely effects on the nervous system. A wide variety of chemicals have been reported to produce behavioral anomalies in humans. Some examples of such chemicals are presented, along with indications of the difficulties involved in interpreting the results of such studies. The maximum allowable concentrations of chlordane in the USSR is 0.01 mg/m$^3$, and in the US is 0.5 mg/m$^3$; the maximum allowable concentration for parathion in the USSR is 0.05 mg/m$^3$ and in the US is 0.1 mg/m$^3$. Part of this difference is due to the use of sensitive behavioral techniques (e.g., conditioned reflex performance tests) for establishing these tolerances in the USSR. In studies on a series of halo-substituted vinyl phosphorus esters effects on rat behavior in the open field test were not correlated with in vitro acetylcholinesterase inhibition, thus the behavioral effect was apparently due to something other than the principal toxic effect.

**77-1486.** Khera, K. S. (Health Protect. Br., Health Welfare Canada, Ottawa, Ontario, Canada). **Significance of metabolic patterns in teratogenic testing for food safety.** *Clin. Toxicol.* 9(5): 773-790; 1976. (89 references)

At present, comparative studies on the metabolism and teratogenicity of food chemicals in a range of species are not available to the extent that firm conclusions can be drawn. In this survey of the literature, it was found that when metabolic data were available in a species, teratogenicity had not always been investigated. The converse also was true. In a few instances where complete information was available it was difficult to explain species differences in teratogenicity in terms of differences in the formation and elimination pattern of metabolites. Correlation of teratogenic to metabolic characteristic of food additives should receive further attention. There appears to be some evidence that parent compounds should receive careful scrutiny during metabolic investigation. The parent compound should be examined for its potential to hydrolyze spontaneously and for its distribution and elimination pattern

in the body. (Author abstract by permission)

**77-1487.** Anonymous. **Comments on alleged carcinogenicity of DDT as documented by EPA, review prepared for House Committee on Appropriation, July 1975.** *Clin. Toxicol.* 9(3): 827-833; 1976.

Comments are presented, mostly on the basis of literature citations, on the EPA administrator's findings that DDT causes tumors, some apparently metastatic, in laboratory animals and therefore may present a carcinogenesis threat to man. The literature suggesting that tumor induction occurs only in rodents, not in other animals, is surveyed. The possibility of such findings being due to stimulation of liver endoplasmic reticulum is supported in that they are also produced by phenobarbital, pyrethrum, alcohol, and many other agents. The anticarcinogenic effects of DDT have not received public attention but are well documented. No carcinogenic effects have been seen in humans exposed to high levels of DDT for many years in occupational or dietary contexts. Thus the complete banning of DDT remains questionable.

**77-1488.** Srivastava, G. N.; Gupta, R. A.; Mohamed, M. P.; Nath, D. (Central Inland Fish. Res. Inst., Allahabad-211001, India). **Effect of sublethal ethyl parathion on the metabolism and activity of *Colisa fasciata* Bloch Schneider).** *Indian J. Environ. Health* 19(1): 63-66; 1977. (8 references)

Effects of sublethal parathion concentrations (0.02 ppm) were examined on the activity and metabolic rate of the Indian weed fish, *Colisa fasciata* (Bloch and Schneider) at 20° and 30°C. The experimental apparatus used was a modification of Fry's respirometer, in which simultaneous measurements of oxygen consumption and random activity were recorded. Metabolic rates were 2-3 times higher at the higher temperature in treated and untreated fish. The metabolic changes relative to controls ranged from 1.3 to 2.4 fold increases for the parathion-treated groups at 20°C and 1.1 to 1.6 fold for the parathion treated groups at 30°C, depending on the time period for which the fish were exposed to the parathion-containing medium. Activity counts correlated with metabolic rates.

**77-1489.** Mendoza, C. E.; Shields, J. B.; Greenhalgh, R. (Food Res. Div., Chem. Safety Bureau, Health Protect. Br., Ottawa, Ontario, Canada K1A OL2.) **Activity of mammalian serum esterases towards malaoxon, fenitroxon and paraoxon.** *Comp. Biochem. Physiol.* 56(2c): 189-191; 1977. (17 references)

Studies were continued on arylesterases in mammalian sera, especially on analyzing the nature of these esterases in relation to malaoxon, paraoxon, and fenitroxon. A knowledge of the types of enzymes present in sera might make it possible to predict the toxicity of certain pesticides to a given species. Arylesterases were found in human, guinea pig, sheep, cat, dog, and rat sera. The paraoxonase (including "fenitroxonase") type of arylesterases is abundant in most species other than human. Cat, rat, and guinea pig sera also contain appreciable carboxylesterase (including malaoxonase) activity. The esterases in human serum may be considered to belong to the arylesterase group but not necessarily a paraoxonase type.

**77-1490.** Subba-Rao, R. V. (Cornell Univ., Ithaca, NY). **Cometabolism of DDT and its effects on microbial communities.** *Diss. Abstr. Int. B* 37(10): 4897-4898; 1977.

Many microorganisms capable of metabolizing non-chlorinated analogues of 1,1,1-trichloro -2,2-bis(*p*-chlorophenyl)- ethane (DDT) such as diphenylmethane (DPM), benzhydrol (BH), *p*-hydroxydiphenylmethane and phenylacetic acid (PA) were isolated from enrichment cultures inoculated with sewage, soil or lake water. Seven of the bacterial isolates capable of actively growing on DPM and BH were tested for their ability to degrade DDT and its metabolites and their non-chlorinated analogues. Resting cells of *Pseudomonas putida* were able to oxidize DPM, BH, benzophenone (BP), PA and benzoic acid when tested in a respirometer. These cells were also found to cometabolize bis(*p*-chlorophenyl) methane (DDM), *o,p'*-dichlorobenzhydrol (DBH) and *p*-chlorophenylacetic acid (PCPA). Resting cells of strains of *Pseudomonas* and *Alcaligenes* cometabolized DDM and DBH. DDT and its metabolites bis(*p*-chlorophenyl) acetic acid (DDA), DDM, DBH and DBP were found to be degraded by resting cells of bacteria and fungi. DDT was converted by resting cells to 1,1-dichloro -2,2-bis(*p*-chlorophenyl) ethylene (DDE), DDM, DBH and DBP; DDA to DDM, DBH and DBP; DDM to DBH and DBP; and DBH to DBP. The effect of chemical structure on the biodegradability of 37 analogues of DDT was investigated. It was found that dichloro, dimethoxy, dihydroxy, dinitro and monochloro substituents on the *p,p'*-positions of the benzene rings hindered biodegradation of these molecules by microorganisms in soil suspensions. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 77-8411).

**77-1491.** Glazer, E. J. (Cornell Univ. Med. Coll., Ithaca, NY). **The neuropathology of organophosphorus toxicity at the cat soleus neuromuscular junction: a**

**light and electron microscopic study.** *Diss. Abstr. Int. B* 37(10): 4995-4996; 1977.

The aim of the present study was to describe the morphologic alterations within the soleus nerve-muscle system after localized DFP poisoning. The neuropathology of the soleus motor system was explored by light and electron microsocopy. In addition, the reactivity of the soleus nerve was assessed by quantifying the incidence of sprouting and reinnervation of poisoned endplates. This was accomplished by vital staining of the soleus intramuscular nerve with methylene blue, using the technique developed by Coers and Woolf (1959). The soleus nerve and muscle were analysed morphologically 1, 2, 3, 4, 6 and 8 weeks followwwing DFP poisoning. Prior to sacrifice the animals' neurologic status was grossly eveluated. At 7 days prominent postjunctional changes were present. These consisted of an acute degeneration within the subneural apparatus and centromyofibrillar disorganization of those muscle fibers located in the vicinity of an endplate. The motor nerve terminals were indistinguishable from the controls at this time. The postjunctional lesions were markedly resolved 14 days after the DFP injection. However, at this time there were early signs of motor nerve terminal degeneration. The lesion at the motor nerve terminal was marked by the appearance of large membranous whorls which replaced the terminal axoplasm and became more severe 3 and 4 weeks after DFP. Reinnervation of the poisoned endplates occurred between 4 and 8 weeks after DFP. The methylene blue study indicated that the poisoned endplates were reinnervated by sprouting from the original terminal axon innervating endplate. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 77-6673.)

**77-1492.** Stiller, D. W. (Univ. Maine, Augusta, ME). **A comparison of the fibrinolytic process in normal and warfarin-treated guinea pigs.** *Diss. Abstr. Int. B* 37(10): 5055-5056; 1977.

This study was designed to determine a possible involvement of vitamin K in the fibrinolytic process of guinea pig plasma. In the first of two approaches, whole blood (plasma) samples were obtained from each animal before and after administering warfarin (1 mg per kg body weight) using an injectable warfarin-ethanol solution (1 mg warfarin per 1 ml ethanol). A lowered prothrombin time, symptomatic of avitaminosis K, was noted in the animal's plasma after the guinea pig was treated with warfarin. The two plasma samples, one obtained before and the other after warfarin injection, were fortified with iodinated fibrinogen and radioactive plasma clots were prepared. The clots were incubated in buffered (pH 7.5) *o*-thymotic acid solution (five mg per ml) to induce lysis. The degree of clot lysis was detected by the amount of radioactivity released from the incubating clot. The rate of fibrinolysis in the normal plasma and the plasma from the warfarin-treated animal was compared at 12, 18 and 24 hours. The fibrinolytic rate associated with the clots prepared from the plasma of warfarin-treated animals was increased very significantly ($P < 0.01$) over that of the control clots. Complete clot lysis normally occurs after 24 hours incubation; however, these clots were 59% lysed at 12 hours and completely lysed at 18 hours incubation. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 77-8334).

**77-1493.** Chiou, C. T.; Freed, V. H.; Schmedding, D. W.; Kohnert, R. L. (Dep. Agric. Chem., Environ. Health Sci. Ctr., Oregon State Univ., Corvallis, OR). **Partition coefficient and bioaccumulation of selected organic chemicals.** *Environ. Sci. Technol.* 11(5): 475-487; 1977. (35 references)

An empirical equation is established to relate the experimental *n*-octanol/water partition coefficients to the aqueous solubilities of a wide variety of chemicals including aliphatic and aromatic hydrocarbons, aromatic acids, organochlorine and organophosphate pesticides, and polychlorinated biphenyls. Such a correlation, covering more than eight orders of magnitude in solubility (from $10^{-3}$ to $10^{4}$ ppm) and six orders of magnitude in partition coefficient (from 10 to $10^{7}$), allows an assessment of partition coefficient from solubility with a predicted error of less than one order of magnitude. A correlation is observed between the bioconcentration factors in rainbow trout and the aqueous solubilities for some stable organic compounds. (Author abstract reprinted by permission of the American Chemical Society)

**77-1494.** Colson, A. M.; The Van, L.; Convent, B.; Briquet, M.; Goffeau, A. (Lab. Enzymol., Univ. Louvain, Louvain-La-Neuve, France). **Mitochondrial heredity of resistance to 3-(3,4-dichlorophenyl)-1,1-dimethylurea, an inhibitor of cytochrome b oxidation, in *Saccharomyces cerevisiae*.** *Eur. J. Biochem.* 74(3): 521-526; 1977. (25 references)

Diuron (3-(3,4-dichlorophenyl)- 1,1-dimethylurea) inhibits cytochrome b oxidation and cytochrome c reduction. Three diu(r) resistant (diuron) mutants of *Saccharomyces cerevisiae* were selected. The mutant diu(r)-64 exhibits in vivo cross resistance to antimycin A while diu(r)-34 and diu(r)-1 are more sensitive to antimycin A than the parental strain. Mitochondrial inheritance is judged to exist for these three mutants since mitotic segregation of diuron-resistant and diuron-sensitive diploids is ob-

5, 10 or 25 μ/kg dissolved in acetone/corn oil (0.5/9.5, v/v) and controls received an equal volume of vehicle. All rats were sacrificed 20 days post-treatment. Common bile ducts of rats given 1 or 5 μg/kg TCDD could not be distinguished from control but at 10 and 25 μg/kg TCDD dilation, severe hyperplasia and periductal thickening of the duct was consistently observed. The magnitude of the change was great enough to be seen on gross examination. In comparison to the effect of 10 or 25 μg/kg TCDD on the common bile duct, effects of TCDD on the liver were not as readily apparent and consisted of occasional swelling of hepatocytes, necrosis of individual liver cells, aggregations of mononuclear inflammatory cells in periportal and centrilobular zones and aggregations of reticuloendothelial cells in the hepatic parenchyma. Thus, a single oral dose of TCDD, 10 or 25 μg/kg, produces striking effects on common bile duct histology in rats as well as effects on the liver. (Author abstract by permission) (Abstract no. 4152)

**77-1499.** Sadowski, J. A.; Whitlon, D. S.; Suttie, J. W. (Univ. Wisconsin, Madison, WI). **Vitamin K epoxide metabolism: warfarin and DTT.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 1080; 1977.

Dithiothreitol (DTT) stimulates the *in vitro* vitamin K dependent formation of γ-carboxyglutamic acid residues in vitamin K-deficient rat liver microsomes and replaces the requirement for NADH as a reductant needed to form the hydroquinone. Warfarin is a potent inhibitor of the DTT driven carboxylase reaction in intact microsomes, but a much poorer inhibitor when NADH is used as a reductant. In a microsomal system with DTT (but not NADH) as a reductant, vitamin K epoxide is an active form of the vitamin. In a Triton X-100 solubilized system, NADH is required. Warfarin is ineffective as an inhibitor, the epoxide is not an active form of the vitamin, and the conversion of vitamin K epoxide to the vitamin cannot be demonstrated. In microsomal preparations from Warfarin-resistant rats, the sensitivity of both the DTT driven carboxylation and the DTT driven epoxide reduction to Warfarin is decreased. The sensitivity of the NADH driven carboxylase to Warfarin does not differ greatly in normal and Warfarin-resistant rats. Difenecoum, a coumarin active in resistant rats, will inhibit both DTT driven *in vitro* carboxylation and epoxide reduction in Warfarin-resistant rat microsomes. These data support the hypothesis that Warfarin inhibits vitamin K activity through an effect on epoxide reduction and suggests that this reaction is driven by a nonpyridine nucleotide pathway which, *in vitro*, can use DTT instead of the physiologically active reducing agent. (Author abstract by permission) (Abstract no. 4265)

**77-1500.** Bulsiewicz, H.; Rozewicka, L.; Januszewska, H.; Bajko, J. (Dep. Histol. Embryol., Inst. Biostruct., Med. Acad., Szczecin, Poland). **Aberrations of meiotic chromsomes induced in mice with insecticides.** *Folia Morphol. (Warsaw)* 35(3): 361-368; 1976. (12 references)

CFW white mice were given organophosphate insecticides by stomach tube or in the drinking water for 50 or 100 days, then 50 diakinetic-metaphasal plates of primary spermatocytes from mouse were analyzed. Mice treated with malathion, Metox-30 (methoxychlor), or Foschlor-50 (trichlorfon) displayed greater frequencies of chromosomal aberrations such as aneuploidy, polyploidy, associations, univalents, multivalents, gaps, and breaks of chromatids and chromosomes.

**77-1501.** Broda, C.; Nachtomi, E.; Alumot, E. (Inst. Anim. Sci., Agric. Res. Org., Volcani Cent., Rehovot, Israel). **Differences in liver morphology between rats and chicks treated with ethylene dibromide.** *Gen. Pharmacol.* 7(5): 345-348; 1976. (13 references)

Fasted adult male white rats and male leghorn chicks were given EDB at 110 mg/kg in olive oil by stomach tube, then killed at 2-22 hr after EDB administration. No changes detectable by light microscopy occurred during the first 4 hr after EDB administration in rats. Centrisinusoidal dilations were observed at 8 and 12 hr after poisoning. Degenerative changes in the hepatocytes were seen in all preparations 17 hr after poisoning, comprising cytoplasmic and nuclear degeneration. Necrosis was evident in the central and midzone of the liver lobules after 22 hr. The livers of the EDB-treated chicks seemed anatomically normal except for small lesions around the central vein in many livers at 12 and 22 hr after EDB treatment. The portal islands of the livers 22 hr after EDB poisoning were rich in eosinophilic granulocytes.

**77-1502.** Deleu, R.; Barthelemy, J. P.; Copin, A. (Lab. Chim. Anal., Fac. Sci. Agron. Etat, 5800-Gembloux, Belgium). **Identification de onze herbicides du groupe des urees substituees par chromatographie sur couche mince et en phase gazeuse I. Application auz eaux naturelles. [Identification of 11 substituted urea herbicides I. Application to natural waters.]** *J. Chromatogr.* 134(2): 483-488; 1977. (11 references)

By the combined use of two-dimensional thin-layer chromatography and gas chromatography (with an electron capture detector), the authors succeeded in separating and identifying eleven urea herbicides at levels of up to 4 ppb. The method has been applied to natural surface waters. (Author abstract by permission)

tained among the diploid progeny of a cross between sensitive and resistant strains; since non-Mendelian segregation of diuron resistance is observed in spores of tetrads issued from diuron-resistant diploid; and since extensive ethidium bromide treatment leads to the formation of mutants which no longer transmit sensitive and resistant alleles. Allelism tests provided evidence for two distinct diuron-resistant loci. Recombination analysis shows that diuron resistance is not located in the polar region of the mitochondrial genome. Succinate oxidation rates by submitochondrial sonicated particles from the mutants are less sensitive to diuron than from the wild type in vitro.

**77-1495.** Paschoal, L. H. O.; Nanni, M. E.; Bueno, M. A. F.; Nacarato, D. F.; Ribiero, E. P.; Borges, D. C. (Dep. Dermatol., Fac. Cienc. Med., UNICAMP, Sao Paulo, Brazil). **Tratamento de escabiose -- eficacia terapeutica do lindane (escabin).** [**Treatment of scabies with lindane.**] *Folha Med.* 72(3): 287-288; 1976. (4 references) (Portuguese)

The efficacy of lindane (Escabin) in the treatment of scabies was examined in 201 cases between June and October 1975. The three treatment regimens examined were 1% lindane for 3 days, 2% lindane for 3 days, and 1% lindane for 2 days. At the lowest dosage level a 95% cure rate was apparent after 2 wk; this was better than the results obtained with the other dosage levels. The higher socioeconomic status of this group might have contributed to cure. In addition, the incidence of side effects was lowest in this group, 5.0% compared to 8.3% and 20.0% in the other two groups. Side effects included residual pruritis and eczematization of the skin. Treatment should be repeated if no improvement is seen after the first week.

**77-1496.** Yang, K. H.; Peterson, R. E. (Univ. Wisconsin, Madison, WI). **Differential effects of halogenated aromatic hydrocarbons on pancreatic excretory function in rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 356; 1977.

Pretreatment of rats with $CCl_4$ or related chlorinated aliphatic hydrocarbons causes an increase in bile duct-pancreatic fluid (BDPF) flow. Our objective was to determine if halogenated aromatic hydrocarbons (HAHs) also increase BDPF flow. Male, Holtzman rats (300g) were treated for 24 hrs with sesame oil (control) or 5 mmol/kg, ip, of bromobenzene (BB), chlorobenzene, *ortho*-dichlorobenzene, *para* dichlorobenzene (p-CB), or 1,2,4-trichlorobenzene. In all HAH groups, with the exception of p-CB, DBPF flow was greater than control. For p-CB, DBPF flow was similar to control. BDPF chloride concentration in all HAH groups was similar and BDPF protein concentration was lower than that of control. Chloride and protein results tentatively suggest that neither secretin nor cholinergic stimulation is responsible for the increase in BDPF flow. Hepatic bile flow tended to be increased by all HAHs and SGPT activity was increased by BB only. Treatment with L-cysteine hydrochloride (1.9 g/kg, po) or 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD, 10 μg/kg, po) 30 min and 15 days, respectively, before BB administration decreased BDPF flow from that seen with BB alone ($p < 0.05$). Treatment with TCDD for 2 days before BB had no effect on BB BDPF flow response. The mechanism of the enhanced BDPF flow caused by some HAHs, but not p-CB, is not known. (Author abstract by permission) (Abstract no. 457)

**77-1497.** Guengerich, F. P. (Vanderbilt Univ., Nashville, TN 37232). **Microsomal cytochromes P-450: separation, purification, and activities toward toxic substances.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 664; 1977.

Procedures have been developed for the separation of rat liver cytochrome P-450 (P450), based upon the initial step of Imai and Sato (*J. Biochem.* 75, 689 (1974)). Experiments with microsomes from untreated rats and rats treated with phenobarbital or 3-methylcholanthrene indicate that at least eight different P-450s are present under varying conditions. These fractions were all highly purified (to specific contents as high as 15.4 nmol P-450/mg) and can be distinguished by their chromatographic, spectral, and electrophoretic properties; overall P-450 yields are 5-10%. Using modifications of existing procedures (Haugen *et al. J. Biol. Chem. 250*, 3567 (1975)), six different P-450s were obtained from rabbit liver microsomes. The activities of all the P-450s (in the presence of optimal amounts of apparently homogeneous NADPH-P-450 reductase, phospholipid, deoxychloate, NADPH, and $O_2$) were determined for benzphetamine and the environmentally important substrates benzo(a)pyrene, dimethylnitrosamine, aflatoxin $B_1$, parathion, lasiocarpaine, 4-ipomeanol, *N,N*-dimethyl -4- aminoazobenzene, *N*-methyl -4- aminoazobenzene, and 2-(*N*-ethylcarbamoyl hydroxymethyl)- furan. (Author abstract by permission) (Abstract no. 2070)

**77-1498.** Croft, W.; Yang, K. H.; Peterson, R. E. (Univ. Wisconsin, Madison, WI). **Pathological effects of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin on the common bile duct of rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 1060; 1977.

2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD) is the most toxic of the chlorinated dibenzo-*p*-dioxins. Our objective was to conduct a dose response light microscopic study of TCDD effects on histology of the common bile duct in rats. Male Holtzman rats (300 g) were given a single oral dose of TCDD: 1,

**77-1503.** Clark, D. R., Jr.; Prouty, R. M. (U.S. Dep. Interior, Fish Wildl. Serv., Patuxent Wildl. Res. Ctr., Laurel, MD). **Experimental feeding of DDE and PCB to female big brown bats (*Epitesicus fuscus*).** *J. Toxicol. Environ. Health* 2(4): 917-928; 1977. (20 references)

Seventeen female big brown bats collected in Montgomery County, Maryland were fed mealworms containing DDE at 166 ppm; five additional bats received uncontaminated mealworms. Six of the dosed bats were frozen after 54 days of feeding and the remaining 16 were starved to death. Other bats were fed PCB and similarly treated. Starvation caused mobilization of stored DDE and PCB residues. After the feeding periods the weights of DDE-dosed bats had increased significantly more than those of controls, and weights of PCB-treated bats significantly less. During starvation PCB-dosed bats lost weight significantly more slowly than controls. Since PCB levels in dosed bats resembled those found in some free-living big brown bats, PCB residues may be causing metabolic alterations in the bat population. Maximum brain levels (123 ppb DDE, 20 ppb PCB) reached in starving bats did not produce characteristic tremors or convulsions. Two bats on PCB dosage died, probably by a non-neurotoxic mechanism.

**77-1504.** Stotter, D. A. (Dep. Chem., Univ. Essex, Colchester, England). **Metal centres and DDT.** *J. Inorg. Nucl. Chem.* 39(4): 721-727; 1977. (79 references)

Pathways for biological degradation of DDT were reviewed. There appear to be three principal routes for initiation of DDT breakdown in vivo: dechlorination to DDE, reductive dechlorination to DDD, and hydroxylation at C(2), producing dicofol. In living organisms these reactions are often brought about by enzymes. The similarity of in vivo reaction products of DDT to those obtained from its reactions with a number of metal compounds has suggested that metal centers may be involved in the degradation of this insecticide. Several other lines of evidence are presented which also tend to substantiate this hypothesis. Most work has been done on iron-containing systems, particularly iron porphyrins, with emphasis on the production of DDD from DDT. There has also been interest in the more extensive reactions of cobalt complexes with DDT, since $B_{12}$ is another species which may be involved. Low valent chromium and zinc bring about extensive degradation of DDT but are unlikely to be active in vivo.

**77-1505.** Takeda, Y.; Tsukahara, I.; Takaori, S. (Dep. Ophthalmol., Kori Hosp., Kansai Med. Univ., Osaka, Japan). **Effects of chlorfenvinphos, an organophosphate insecticide, on afferent transmission in the central visual system.** *Jpn. J. Ophthalmol.* 20(2): 195-203; 1976. (26 references)

Chlorfenvinphos was injected intraperitoneally to cats immobilized with gallamine. Effects were examined on the electroretinogram as well as the visually evoked responses to photic stimulation in the optic tract, lateral geniculate nucleus, and visual cortex. Chlorfenvinphos increased the a- and b-waves of the ERG (electroretinogram) and reduced the responses in the OT (optic tract) and LG (lateral geniculate nucleus). No consistent changes were observed in the visual cortex (VC). Cholinesterase activity in the retina, LG and VC were reduced to 78-85% of control levels after chlorfenvinfos administration at 4 mg/kg. Intravenous injection of antidotes, glutathione, atropine, or pralidoxime antagonized the effects of chlorfenvinphos on the ERG and on the OT and LG responses. The effects of chlorfenvinphos are probably a result of accumulation of acetylcholine in the cholinergic projection network of the central nervous system.

**77-1506.** Barthalmus, G. T. (Zool. Dep., North Carolina State Univ., Raleigh, NC 27607). **Behavioural effects of mercury on grass shrimp.** *Mar. Pollut. Bull.* 8(4): 87-90; 1977. (13 references)

Conditioned avoidance responses of grass shrimp, *Palaemonetes pugio* Holthuis, tested in aquatic avoidance apparatus, were significantly impaired by subacute exposure to mercuric chloride (0.05 ppm). The control shrimp learned to avoid a shock which followed the appearance of a light after a period of dark adaptation. Shrimp in which an avoidance curve like that of the controls had been previously established quickly lost their ability to avoid the shocks when subsequently exposed to mercury. This seems to confirm the value of a simple behavioral index for establishing subacute toxicity standards for organisms in aquatic ecosystems.

**77-1507.** Sobotka, T. J.; Cook, M. P.; Brodie, R. E. (Div. Toxicol., Food Drug Admin., Washington, DC). **Effects of neonatal malnutrition and perinatal exposure to various pesticides.** *Mater. Med. Pol.* 8(2): 152-155; 1976. (13 references)

Model systems used in the neurobehavioral toxicology program employ a multidiscipliary experimental and epidemiologic appraoch. These studies have suggested interactions between nutritional state and toxin response in the case of heavy metals (lead and mercury). Findings have been observed in animals treated with heavy metals which resemble the pharmacobehavioral characteristics in children with minimal brain dysfunction: altered responsiveness to amphetamine, poor learning performance, and allevia-

tion of the performance deficit by amphetamine treatment. Effects of malnutrition alone have been examined in experimental animals. The most characteristic behavioral manifestation of early malnutrition in animals is heightened "emotional" responsiveness to stressful conditions. [Note: pesticides per se were not mentioned.]

**77-1508.** Chahal, D. S.; Bans, I. S.; Chopra, S. L. (Dep. Microbiol., Punjab Agric. Univ., Ludhiana, Punjab, India). **Degradation of alachlor (2-chloro -N-(methoxymethyl) -2',6'- diethylacetanilide) by soil fungi.** *Plant Soil* 45(3): 689-692; 1977. (12 references)

Two fungi, a *Penicillium* sp. and a *Trichoderma* sp., were isolated from a soil previously treated with alachlor. Spores of these fungi were inoculated into 50 ml of mineral salt medium containing 12.5 mg of alachlor as the sole source of carbon. Benzene was found to be the best solvent for extracting alachlor and its degradation products from the suspension; benzene extracts were then subjected to thin layer chromatography. Each of the chromatographic plates thus produced after 15 days of incubation contained two spots: one corresponding to unchanged alachlor and a second with an *Rf* value of 0.54. The chromatogram after 30 days of incubation contained an additional spot with an Rf value of 0.96.

**77-1509.** Luton, J. P.; Mathieu de Fossey, B.; Bricaire, H. (Cent. Rech. Endocrinol., Hopital Cochin, Paris Cedex 14, France). **Le syndrome de Cushing. Traitement medical ou chirurgie? [Cushing's syndrome: medical or surgical treatment?]** *Sem. Hop. Paris Therapeutique* 53(1): 35-38; 1977. (6 references) (French)

The methods of treating Cushing's syndrome vary depending on the etiology of the condition. Surgery is indicated in the case of adrenal or pituitary tumors, but medical and/or radiotherapeutic treatment may be required before or after surgery. Even in cases of other than cancerous etiology, surgical treatment is often preferred. Principal agents used in medical treatment of Cushing's syndrome are aminoglutethimide, cyproheptadine, and *o,p'*-DDD (TDE). DDD is primarily useful in benign adrenal hyperplasia. If treatment with *o,p'*-DDD at 10-12 mg/day for 15 days, then 8-10 mg/day is not successful within six months, surgery may be the only recourse. A second course of treatment may be tried if clinical recovery is encouraging but biological results are insufficient. Renal and hematologic side effects of DDT have been observed, but not neurological effects as observed by other authors. Liver function is occasionally disturbed. The lack of effect on sex hormones is remarkable. Hypercholesterolemia develops gradually and may reach 4-5 g/liter after 6 mo of treatment. It disappears within one week after administration of *o,p'*-DDD is stopped. Digestive symptoms have been largely avoided by giving gelatine capsules containing powdered *o,p'*-DDD covered with cellulose acetylphthalate.

**77-1510.** Wood, S., Jr.; Thornes, R. D. (Author address not given). **Effekt von Warfarin auf Tumorzellen in vivo. [Effect of warfarin on tumor cells in vivo.]** *Thrombosis Diathesis Haemorr. Suppl.* 62: 121; 1976. (German)

Implantation of a plastic chamber into the rabbit ear was followed in 2-3 wk by vascularization of the chamber. Microscopic examinations could then be performed regarding the extravascular and intravascular behavior of various cell systems. Small fragements of V2 rabbit carcinoma were transplanted to these chambers. The movement of the tumor cells was observed using time-lapse cinematogrpahy. Administration of warfarin to the rabbits resulted in a 2-fold increase in the thromboplastin time and caused complete cessation of the inherent tumor cell movement for 20 days or more. Intravenous injection of vitamin K restored the mobility of the tumor cells within 3-4 hr after administration. (Summary of a 16 mm film)

**77-1511.** Seifert, J.; Vacha, J. (Inst. Pharmacol., Czechoslovak Acad. Sci., Prague, Czechoslovakia). **Decreased utilization of [2-$^{14}$C] orotic acid for the synthesis of cytidine nucleotides in rat liver after administration of α-hexachlorocyclohexane.** *Toxicology* 7(2): 155-161; 1977. (19 references)

Utilization of [2-$^{14}$C-]orotic acid for the synthesis of liver cytidine nucleotides was reduced by intragastric administration of α-hexachlorocyclohexane to rats at 100 mg/kg. The specific radioactivities of the uridine components of the acid-soluble pool and rRNA increased during the first hours of treatment with the drug. The specific radioactivities of the uridine nucleotides remained unchanged in the later experiments, while those of cytidine components gradually decreased. Administration of hydrocortisone increased the incorporation of labeled orotic acid into rRNA cytidylic acid.

**77-1512.** Gupta, P. K.; Paul, B. S. (Indust. Toxicol. Res. Ctr., Lucknow, India). **Biological fate of $^{32}$P-malathion in *Gallus domesticus*** (Desi poultry birds). *Toxicology* 7(2): 169-177; 1977. (5 references)

A technique of minor surgery was developed for separating urine and feces in birds. The fate of $^{32}$P-malathion was studied in Desi chickens following a single oral dose of 394 mg/kg. The bird showed characteristic signs of organophosphate poisoning.

The results suggested that the compound is rapidly absorbed from the gastrointestinal tract. Significant quantities were detected in plasma 0.5 hr after ingestion. The maximum concentrations of $^{32}P$ were found 6-8 hr after administration. The $^{32}P$ level was highest in the liver after 6 hr. After 48 hr $^{32}P$ was no longer detectable except in liver, kidney, lung and spleen. In the excretion study 90% of the compound was excreted in 24 hr, mainly via the urine, with only small amounts in the feces. The compound was quickly metabolized, so accumulation is unlikely.

**77-1513.** Weisse, I.; Herbst, M. (Dep. Exp. Pathol. Toxicol., C. H. Boehringer Sohn, 6507 Ingelheim/Rhein, Germany). **Carcinogenicity study of lindane in the mouse.** *Toxicology* 7(2): 233-238; 1977. (32 references)

Lindane was examined for possible carcinogenic effects in 500 mice (50% males and 50% females) of the Chbi: NMRI (SPF) strain. The study lasted 80 weeks. Substance-related production of tumors was not evident at the dosage levels employed (12.5, 25, and 50 ppm). The tumors found corresponded in type and frequency to those occurring spontaneously in this strain. No evidence of lindane-induced fine structural hepatocellular alterations was seen in electron microscopic examinations of livers, performed at the same time.

**77-1514.** Chadwick, R. W.; Simmons, W. S.; Bruden, C. C.; Chuang, L. T.; Key, L. M.; Chadwick, C. J. (Biochem. Br., Environ. Toxicol. Div., Environ. Res. Ctr., Research Triangle Park, NC 27711). **Effect of dietary lipid and dimethyl sulfoxide on lindane metabolism.** *Toxicol. Appl. Pharmacol.* 39(3): 391-410; 1977. (52 references)

Previous investigations have suggested that there is a requirement of dietary polyunsaturated fatty acids for full expression of microsomal enzyme induction. The conclusions in these studies were primarily based on *in vitro* enzyme activity, sleeping time recovery, or hepatic cytochrome P-450 content, measured 24 hr after treatment with an inducing agent. This study set out to examine the influence of dietary lipids, containing different fatty acid compositions, on the storage and self-induction of lindane metabolism. The alteration in metabolism was followed on a daily basis throughout the treatment period. Twenty-four female weanling rats were fed fat-free diets either unsupplemented or supplemented with 7% hydrogenated coconut oil, 7% peanut oil, or 5% menhaden oil plus 2% linseed oil for 12 days prior to treatment with lindane. All rats then received a daily po dose of 2.5 mg of lindane in dimethyl sulfoxide (DMSO) for 7 days. On Day 8, all rats were treated with 2.5 mg of lindane (containing 1.93 $\mu$Ci of [$^{14}C$]lindane) and they were sacrificed 24 hr later. Tissue samples were analyzed for radioactivity. Liver samples were assayed for microsomal phospholipid, protein, and cytochrome P-450 plus the enzymatic dehydrogenation of lindane. In addition, the fatty acid content of microsomal phosphatidylcholine (PC) and phosphatidylethanolamine (PE) was determined. Depressed food consumption and growth rate, an impaired metabolite excretion pattern, low specific microsomal phospholipid content, and a decreased microsomal PC/PE ratio containing a reduced proportion of polyunsaturated fatty acids suggested that a toxic lindane-DMSO-dietary lipid interaction had occurred. (Author abstract by permission)

**77-1515.** Stevens, J. T.; Oberholser, K. M.; Wagner, S. R.; Greene, F. E. (Dep. Pharmacol., Milton S. Hershey Med. Ctr., Hershey, PA 17033). **Content and activities of microsomal electron transport components during the development of dieldrin-induced hypertrophic hypoactive endoplasmic transport.** *Toxicol. Appl. Pharmacol.* 39(3): 411-421; 1977. (38 references)

The addition of dieldrin (50 ppm) to the diet of male and female rats produced an early induction of drug metabolism accompanied by an increase in the microsomal electron transport components. However, the rates of metabolism of aldrin, ethylmorphine, and aniline in males and of aldrin and aniline metabolism in females declined toward control values during subsequent weeks. These decreases occurred despite continuous exposure to dieldrin and continued induction of cytochrome P-450, NADPH oxidase, and NADPH cytochrome c reductase. In several instances, the metabolism of substrate per unit of cytochrome P-450 was lower in dieldrin-induced microsomes than in microsomes from controls. This condition has previously been termed hypoactive hypertrophic endoplasmic reticulum (HHER). In the male, HHER appeared to be related to alterations in the binding of the Type I substrates ethylmorphine and aldrin to cytochrome P-450. However, decreases in aniline metabolism in both males and females appeared to be unrelated to changes in binding. HHER did not develop in microsomes from female rats with respect to ethylmorphine and aldrin metabolism. Our results suggest that the appearance of HHER may represent a decompensation phase of dieldrin response, but instead may be due to qualitative changes in the induced cytochrome P-450.

**77-1516.** Chadwick, R. W.; Chadwick, C. J.; Freal, J. J.; Bryden, C. C. (Biochem. Br., Environ. Toxicol. Div., Environ. Res. Ctr., Research Triangle Park, NC 27711). **Comparative enzyme induction and lindane metabolism in rats pretreated with various**

**organochlorine pesticides.** *Xenobiotica* 7(4): 235-246; 1977. (20 references)

The comparative effect of 7 days pre-treatment with one of seven organochlorine pesticides on the metabolism of lindane *in vivo* and on the metabolism of EPN, *p*-nitroanisole and methyl orange *in vitro* was investigated. Mirex was the most potent inducer of the oxidative hydrolysis of EPN, the *O*-demethylation of *p*-nitroanisole and the azo reduction of methyl orange. Chlordane and DDT were equipotent, followed by hexachlorobenzene, toxaphene, pentac and penphene. Enzyme activity of rats pre-treated with the latter three pesticides was not significantly higher than that of controls. DDT stimulated significantly greater metabolism of lindane than did pre-treatment with any of the other six pesticides. In general DDT, mirex, chlordane and hexachlorobenzene were the most effective activators of lindane metabolism followed by toxaphene, pentac and penphene. Only pre-treatment with penphene failed to stimulate a significantly higher excretion of radiolabeled lindane metabolites than that excreted by controls. Comparative differences in lindane metabolism *in vivo* were not adequately reflected by the determination of enzyme activities *in vitro*. Pre-treatment with organochlorine pesticides altered lindane metabolism by selective effects on specific metabolic pathways. (Author abstract by permission)

**77-1517.** Drandarevski, Ch. A.; Eichler, D.; Domsch, K. H. (Celamerck GmbH & Co. KG, D-6507 Ingelheim/Rhein, Germany). **Das Verhalten von Triforine im Boden und die Beeinflussung von mikrobiologischen Bodenprozessen. [Behavior of triforine in soil and its influence on microbiological soil processes.]** *Z. Pflanzenkr. Pflanzensch.* 84(1): 18-30; 1977. (16 references) (German)

Levels of triforine in soil were examined in laboratory and field experiments using quantitative (GLC) and semiquantiative (bioassay) methods to study leaching, degradation, and effects of triforine on microbiological soil processes. Triforine does not pentetrate into deeper layers of soil; it was generally found only in the 0-10 cm layer. Triforine was not detected in seepage water. More than half the triforine initially present was degraded within the first three weeks. The chemical degradation was accompanied by loss of biological activity against the test fungi *Cladosporium cucumerinum* and *Erysiphe graminis*. Microbiological soil processes were not afected by triforine. Neither microbial decomposition of plant waste treated with triforine nor soil nitrification were inhibited by triforine. The population density of fungi on the soil particles and the content of bacteria, streptomycetes, and fungi were not reduced. Weight gain of *Eisenia foetida* fed on plant material treated with triforine was not affected.

**77-1518.** Sikka, H. C.; Butler, G. L.; Rice, C. P. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Effects, uptake, and metabolism of methoxychlor, mirex, and 2,4-D in seaweeds.** *Natl. Tech. Inform. Serv.* PB-255,432, 1976, 49 p.

The report presents the results of a study concerning effects, uptake, and metabolism of mirex, methoxychlor, and 2,4-D in the seaweeds *Ulva* sp., *Enteromorpha* sp., and *Rhodymenia* sp. None of the pesticides, at concentrations corresponding to their maximum solubility in seawater, had any significant effect on photosynthesis, protein, carbohydrate, lipid, chlorophyll, carotenoid or trace metal content of the algae. All three algae removed substantial amounts of mirex and methoxychlor from the medium, but uptake of 2,4-D was extremely low. The rate of uptake of methoxychlor was considerably greater than that of mirex. Enteromorpha accumulated considerably more mirex and methoxychlor than Ulva or Rhodymenia. Both Ulva and Enteromorpha failed to metabolize either mirex or 2,4-D. Enteromorpha metabolized methoxychlor to a limited extent. After 7 days of incubation with carbon-labeled methoxychlor, a major portion of the label in the tissue and medium was present in unchanged methoxychlor. A small amount of radioactive metabolite, 2,2-bis (*p*-methoxyphenyl)-1, 1-dichloroethylene, was detected in both the tissue and medium. (Author abstract by permission)

**77-1519.** Macek, K. J.; Buxton, K S.; Sauter, S.; Gnilka, S.; Dean, J. W. (EG and G, Bionomics, Wareham, MA). **Chronic toxicity of atrazine to selected aquatic invertebrated and fishes.** *Natl. Tech. Inform. Serv.* PB-255,439, 1976, 60 p.

Representatives of the aquatic invertebrate species of water flea (*Daphnia magna*), midge (*Chironomus tentans*), and scud (*Gammarus fasciatus*); and the fish species bluegill (*Lepomis macrochirus*), fathead minnow (*Pimephales promelas*), and brook trout (*Salvelinus fontinalis*) were chronically exposed to various concentrations of atrazine in separate flowing-water systems. Maximum acceptable toxicant concentrations (MATC) of atrazine for the selected species in soft water were estimated using survival, growth, and incipient-LC50 for fishes and the 48-hour LC50 for invertebrates was estimated from acute exposures and was used to calculate application factors (MATC/LC50). (Author abstract by permission)

**77-1520.** Macek, K. J.; Buxton, K. S.; Derr, S. K.; Dean, J. W.; Sauter, S. (EG and G, Bionomics, Wareham, MA). **Chronic toxicity of lindane to selected aquatic invertebrates and fishes.** *Natl. Tech. Inform. PB-256,334, 1976, 58 p.*

Representatives of the aquatic invertebrate

species of water flea (*Daphnia magna*), midge (*Chironomus tentans*), and scud (*Gammarus fasciatus*) and the fish species of bluegill (*Lepomis macrochirus*), fathead minnow (*Pimephales promelas*), and brook trout (*Salvelinus fontinalis*) were chronically exposed to various concentrations of lindane in separate flowing water systems. Maximum acceptable toxicant concentrations (MATC) of lindane for the selected species in soft water were estimated using survival, growth, and reproduction as indicators of toxic effects. (Author abstract by permission)

**77-1521.** Baron, R. L. (Health Eff. Res. Lab., Research Triangle Park, NC). **Pesticide induced delayed neurotoxicity--proceedings of a conference held in Washington, DC on February 19-20, 1976.** *Natl. Tech. Inform. Serv.* PB-256,416, 1976, 309 p.

Topics covered include: recognition and overview of the organophosphorus problem; reaction of serine esterases relevant to the delayed neuro-toxicity problems; the mechanism of action of neurotoxic organophosphorus esters; structure/activity relationships among organophosphorus esters with respect to delayed neuropathy; the pathology of delayed neurotoxicity due to organo-phosphates; persistent effects of organophosphate exposure as evidenced by electroencephalographic measurements; organophosphate exposure from industrial usage; electroneuromyography in occupational medical supervision of exposed workers; pesticide-induced delayed neurotoxicity: poison control or medical aspects; test protocols and limitations for detection of neurotoxicity; organophosphate exposure from agricultural usage; and pesticide regulatory responsibility. (Author abstract by permission)

**77-1522.** Bland, C. E.; Ruch, D. G.; Salser, B. R.; Lightner, D. V. (Dep. Biol., East Carolina Univ., Greenville, NC). **Chemical control of *Lagenidium*, a fungal pathogen of marine crustacea.** *Natl. Tech. Inform. Serv.* PB-257,346, 1976, 43 p.

The effects of twelve potentially fungitoxic compounds on growth and development of two strains of *Lagenidium callinectes* Couch were studied. The compounds tested were Benlate (benomyl), Captan, Dichlone, Difolatan, DS 9073, Dyrene, malachite green, Manzate 200 (dithane M-45, maneb), Terrachlor, Treflan (trifluralin), tribasic copper sulfate, and Vitavax (carboxin). In vitro tests included determination of the minimum lethal concentration (LC100) of each fungicide, the effects of the LC100 on length of motility, flagellar retraction or detachment, encystment and germination, and the length of time necessary for the LC100 of each fungicide to kill zoospores of *L. callinectes*. Various animal toxicity tests were conducted also with several of the fungitoxic compounds. Only two compounds, malachite green and DS 9073, appear to be of potential use as disease deterrents in mariculture. (Author abstract by permission)

**77-1523.** Alexander, M. (Cornell Univ., Ithaca, NY). **Microbial degradation of DDT.** *Natl. Tech. Inform. Serv.* AD-A026,575, 1976, 44p.

The products formed in the metabolism of DDT by bacteria and fungi were identified as 1,1-dichloro-2,2-bis (*p*-chlorophenyl)ethane, 1,1-dichloro -2,2-bis (*p*-chlorophenyl) ethylene, DDM, DBH, and DBP. Several other, as yet uncharacterized products were also synthesized by these microorganisms. The compounds identified during the degradation of DDT metabolites were: DDM, DBH and DBP from DDA; DBH and DBP from DDM; and DBH from DBP. An important metabolite reported for the first time with fungi is *p*-chlorophenylacetic acid (PCPA), a ring cleavage product generated in the degradation of DDM. *p*-Chlorophenyl gly-oxaldehyde is also reported for the first time as a product of ring cleavage. *Arthrobacter* sp., an isolate capable of utilizing phenylacetic acid as sole source of carbon, was tested for its ability to degrade PCPA. (Author abstract by permission)

**77-1524.** French, J. E.; Roberts, J. F. (Armed Forces Radiobiol. Res. Inst., Bethesda, MD). **Effect of DDT and polychlorinated biphenyls on cell population growth of *Crithidia fasciculata*, a flagellated protozoan.** *Natl. Tech. Inform. Serv.* AD-A026,867, 1976, 20 p.

Cell population growth inhibition of *Crithidia fasciculata* by cell density and cell protein assays after *p,p'*-DDT and polychlorinated biphenyl (PCB) exposure during exponential growth was analyzed. DDT was apparently not metabolized by this cell. In vitro tests indicated that PCB toxicity increased with decreasing percent chlorination of the mixture. DDT and PCB (Aroclor 1254) were calculated to have ID50 values of 524.0 and 10.5 ppm after 12 and 24 hours exposure, their respective period of greatest cell population growth inhibition. Cell density correlated with cell protein as a measure of toxicity for PCB but not for *p,p'*-DDT. A critical concentration range was observed above which the effects were decreased relative to those from lower concentrations employed. The maximum concentration of DDT associated with the cellular compartment occurred by 6 hours of exposure.(Author abstract by permission)

**77-1525.** Szaflarska-Stojko, E. (Div. Pathomorphol., Inst. Pathol., Silesian Acad. Med., Katowice, Poland). **Badania patomorfotzczne nad toksyczncscia i**

**patomechanizmem dzialania lindanu, karbarylu i gamma karbatoxu—pestycydami produkcji krajowej. [Pathomorphological studies of toxicity and pathomechanism of the poisoning action of lindane, carbaryl and gammacarbatox, domestically produced pesticides.]** *Med. Pr.* 27(3): 235-238; 1976. (Polish)

Lindane, carbaryl, and gamma-carbatox, the last a combination of the preceding two compounds, were tested to determine their LD50 (acute) and effects on weight gain. Macroscopic and histopathologic changes were examined in the organs of 580 rats, 3-mo-old, equal numbers of male and female, given pesticide-contaminated feed over a period of 3 mo. Test dosages were 20-2000 ppm of lindane, 100-10000 ppm of carbaryl, and 10-1000 ppm of lindane + 50-5000 ppm of carbaryl for the combination compound. All animals were sacrificed after 14 wk and their tissues were routinely stained. It was determined that all 3 pesticides stopped the body weight gain in acute tests and slowed down the rate of weight gain in chronic tests. Acute lindane intoxication caused syndromes typical of chlorinated hydrocarbons and carbaryl caused typical cholinesterase inhibition symptoms. In chronic studies, only lindane produced clear-cut intoxication symptoms at the highest doses. The degree of gamma-carbatox poisoning depended on its lindane content. With all 3 pesticides, the result of the investigation showed mostly reversible, retrogressive changes, circulatory disorders, progressive and inflammatory organ changes. Spinal cord neurocytes were extremely sensitive to drug action. Liver and other parenchymatous organs also revealed morphological damage, and the intestine showed inflammatory changes. Lindane and gamma-carbatox proved to be much more toxic than carbaryl.

**77-1526.** Fishbein, L. (Natl. Ctr. Toxicol. Res. Jefferson, AR). **Teratogenic, mutagenic, and carcinogenic effects of insecticides.** ***IN:*** *Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution.* Commission of the European Communities, Luxembourg, 1975, p. 725-750. (13 references)

Teratogenicity, mutagenicity, and carcinogenicity of pesticides are currently under debate and are interrelated. Contradictory and ambiguous examples are cited from the literature in regard to the adverse effects of organochlorine organophosphate and carbamate insecticides.

**77-1527.** Buchet, J. P.; Lauwerys, R.; Roels, H. (Unite Toxicol. Indust. Med., Univ. Catholique de Louvain, Brussels, Belgium). **Influence des pesticides organophosphores sur le metabolisme des graisses neutres chez le rat. [Effects of organophosphorus pesticides on neutral fat metabolism in the rat.]** ***IN:*** *Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution.* Commission of the European Communities, Luxembourg, 1976, p. 887-895. (5 references) (French)

The increasing use of organophosphorus pesticides results in prolonged exposure to low pesticide concentrations, e.g., in the form of residues in food. In addition to inhibiting cholinesterase many organophosphorus pesticides inactivate hydrolases, in particular some enzymes involved in lipid metabolism. Various glyceridase activities were observed in vitro in rat heart, intestine, and adipose tissue in the presence of organophosphorus compounds. In in vivo experiments rats were given triamiphos in the diet at the rate of 10 ppm for three months to one year. Serum free fatty acids and total cholesterol in the aorta were significantly increased in animals on standard diet and the later factor was also increased compared to controls in animals on a high-fat diet.

**77-1528.** Canton, J. H.; Greve, P. A.; Stooff, W. (Nat. Inst. Pub. Health, Bilthoven, The Netherlands). **A laboratory model system for the study of the accumulation of chemicals in the aquatic food chain, exemplified on α-hexachlorocyclohexane.** ***IN:*** *Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution,* Commission of the European Communities, Luxembourg, 1975, p. 1479-1489. (3 references)

The accumulation and elimination of α-HCH (α-BHC) was studied on a laboratory scale food chain model consisting of an alga (*Chlorella pyrenoidosa*), a crustacean (*Daphnia magna*), and a fish (*Lebistes reticulata*). Accumulation and elimination took place in 96 hr for all three organisms; accumulation occurred more rapidly, in 3 hr, from water with low α-BHC concentrations. Accumulation factors ranged from 60 to 350 and were concentration-dependent for daphnia and guppy. The concentrations accumulated were close to the EC50 values for paralysis and mortality in these organisms. The most sensitive result was obtained with the daphnia reproduction study; this was used to attain a proposed ecological limit for α-BHC, which limit is often exceeded in Dutch surface waters.

**77-1529.** Notten, W. R. F. (Inst. Pharmacol., Univ. Nijmegen, The Netherlands). **Alteration in urinary D-glucaric acid excretion as an indication of exposition to xenobiotics.** ***IN:*** *Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution.* Commission of the European Communities, Luxembourg, 1975, p. 2047-2060. (24 references)

Many exogenous compounds, especially lipophilic ones, can stimulate certain liver enzymes.

These enzymes may transform the xenobiotic but also certain endogenous compounds. One such enzyme system is the D-glucuronic acid pathway in the liver, stimulation of which leads to enhanced excretion of L-ascorbic acid and D-glucaric acid. Thus elevated urinary D-glucaric acid may indicate exposure to exogenous compounds. Several pesticides along with other xenobiotics were examined for ability to enhance urinary D-glucaric acid excretion in the guinea pig and rat. Elevations of 5-35% were found in comparison to control levels, except in the case of phenylmercuric acetate, which produced a 49% depression. Greatest increases in urinary D-glucaric acid excretion were seen following administration of hexachlorobenzene and heptachlor. Thus this test seems useful as a general measure of exposure.

**77-1530.** Falk, H. L. (Nat. Inst. Environ. Health Sci., Research Triangle Park, NC). **Interaction of environmental chemicals, enzymatic changes and their possible effects on health.** *IN: Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution*, Commission of the European Communities, Luxembourg, 1975, p. 2331-2350. (56 references)

Enzyme-xenobiotic interactions result in increased or decreased toxicity due to one environmental factor by prior or concomitant exposure to another. Differences in enzyme induction are seen between species, strains, and individuals, and also between organs or tissues of the same species. Variations in the increase in certain enzyme activities suggest that multiple enzymes are involved. Some instances of increased or decreased toxicity due to chemical interactions are reviewed. Although most data on enzyme induction and inhibition has been obtained from laboratory animals, this mechanism is also effective in man. The effective levels used in laboratory experiments for many chemicals are not much higher than those daily encountered by man.

**77-1531.** Weiss, B. (Dep. Radiation Biol. Biophys., Univ. Rochester Sch. Med. Dent., Rochester, NY). **Behavioral methods for investigating environmental health effects.** *IN: Proc. Int. Symp. Recent Advances in the Assessment of the Health Effects of Environmental Pollution*, Commission of the European Communities, Luxembourg, 1975, p. 2415-2433. (16 references)

Three phases may exist in the assessment of behavioral changes induced by environmental contaminants. During the nonspecific screening phase a search is made for general CNS effects. The methods used are fairly simple, including observations of unlearned behavior and simple learned behavior. The second phase focuses on specific functions such as sensory and motor function and complex discriminative processes. These techniques generally involve highly trained animals and advanced instrumentation, including computers. The third phase focuses on human health, and is naturally the most difficult phase.

**77-1532.** Dorough, H. W. (Dep. Entomol., Univ. Kentucky, Lexington, KY 40506). **Biological activity of pesticide conjugates.** *ACS Symp. Ser.* 29: 11-34; 1976. (50 references)

Pesticide conjugates produced in living systems are potentially biologically active. A sequential approach to determining the significance of pesticide conjugates would include determination of bioavailability, degradation/excretion rates, carcinogenic/mutagenic potential, effects in 90-day feeding studies, identity and synthesis route of active components, and full toxicological significance. Results of these studies would determine the commercial fate of the parent compound.

**77-1533.** Frear, D. S. (Metab. Radiation Res. Lab., Agric. Res. Serv., Fargo, ND 58102). **Pesticide conjugates--glycosides.** *ACS Symp. Ser.* 29: 34-54; 1976. (79 references)

Examples of *O*-glucoside, *N*-glucoside, *S*-glucoside, glucose ester, acylated glucoside, and gentobioside metabolites of pesticides and plant growth regulators were reviewed. The metabolites were examined in terms of their isolation, identification, metabolism, and significance in plants and insects. Glucosides often account for a major portion of pesticide metabolites in plants and invertebrates. Many glucosides have been identified to date, and more will undoubtedly be identified in the future. However, the enzyme systems responsible for glucoside formation and hydrolysis have not been studied to any great extent. The further metabolism of glucoside metabolites has also received insufficient attention.

**77-1534.** Bakke, J. E. (Metab. Radiat. Res. Lab., Agric. Res. Serv., Fargo, ND 58102). **Recent advances in the isolation and identification of glucuronide conjugates.** *ACS Symp. Ser.* 29: 55-67; 1976. (29 references)

Four materials have recently been successfully applied to the extraction or concentration of glucuronides present in mammalian plasma, urine, and bile (or other aqueous solutions). They are a synthetic polystyrene polymer, a gas chromatography column packing, liquid anion exchangers, and a gel filtration medium. Methods applied to separation of glucuronide conjugates include anion exchange cellulose columns, countercurrent distribution, and paper

chromatography, in addition to the extraction techniques mentioned. Identification methods include mass spectrometry.

**77-1535.** Mumma, R. O.; Hamilton, R. H. (Dep. Entomol., Biol., Pestic. Res. Lab., Pennsylvania State Univ., University Park, PA 16802). **Amino acid conjugates.** *ACS Symp. Ser.* 29: 68-85; 1976. (45 references)

Amino acid conjugates of pesticides have been reported in plants and animals. The chemical and physical properties, isolation, purification and identification, biological properties and metabolism, and analytical methods of some of these conjugates are discussed. Aspartic acid conjugates are most abundant in plants, but conjugates with glutamic acid, alanine, valine, leucine, phenylalanine, and tryptophan have also been identified. The biological significance of these conjugates is under investigation, but preliminary results have indicated some biological activity for the conjugates or perhaps their hydrolysis products.

**77-1536.** Paulson, G. D. (Metab. Radiat. Res. Lab., Agric. Res. Serv., Fargo, ND 58102). **Sulfate ester conjugates -- their synthesis, purification, hydrolysis, and chemical spectral properties.** *ACS Symp. Ser.* 29: 86-102; 1976. (154 references)

There is a large body of literature dealing with sulfate ester conjugates, but workers in this field do not always take advantage of these findings. In many studies the sulfate esters were hydrolyzed and the "nonpolar" hydrolysis product identified, whereas it has now been found that isolation of the intact molecule is important. Artifacts may be produced by hydrolysis procedures. The possibility of error is inherent in enzyme hydrolysis studies as well. IR spectroscopy has proven especially useful in characterizing sulfate ester conjugated pesticide metabolites.

**77-1537.** Hutson, D. H. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **Glutathione conjugates.** *ACS Symp. Ser.* 29: 103-131; 1976. (69 references)

Glutathione conjugation was first observed in a study of the fate of halobenzenes in animals; almost 100 years elapsed before the reaction pathway for their formation was fully elucidated. Chemical requirements are reviewed for glutathione conjugation by alkyl transfer, aralkyl transfer, aryl transfer, epoxide transferases, alkene transfer, alkyl mercapto transfer, and transfer of nitrogen heterocycles. Techniques used to investigate cysteine and glutathione (GSH) conjugation include isolation of mercapturic acids and glutathione conjugates. Glutathione conjugates are also studied by enzymic synthesis and degradation. GSH transferases appear to be widespread in nature, occurring in mammals, birds, insects, and plants. They play a role in the metabolism of steroidal estrogens in vivo. Formation of a GSH conjugate effects a dramatic change in the physical properties of a molecule. In mammals GSH conjugation renders the compounds ideally suited for biliary excretion.

**77-1538.** Iwan, J. (Plant Protect. Div., Schering AG, Berlin/Bergkamen, Germany). **Miscellaneous conjugates -- acylation and alkylation of xenobiotics in physiologically active systems.** *ACS Symp. Ser.* 29: 132-152; 1976. (2 references)

Formation of conjugates can affect the biological activity of a pesticide or drug by decreasing the lipid solubility and by altering molecular structures essential for the exertion of physiological effects. Conjugation normally results in detoxification, but this is not always the case with acylation and alkylation. Examples of acylations and alkylations of xenobiotics, especially pesticides, are reviewed. Acetylation of an amino group of a xenobiotic is the best understood ayclation reaction. Conjugation with other carboxylic acids is also possible, e.g., formylation and malonic acid conjugation. Experimental evidence was obtained that methylation of arsenic and other metalloids was mediated by an active form of methionine; these findings were extended to other chemical groups and were further explained. Methylation is the only alkyl group gransfer known to occur in nature at present.

**77-1539.** Sutherland, M. L. (Monsanto Agric. Co., St. Louis, MO 63166). **Nature of propanil bound residues in rice plants as measured by plant fractionation and animal bioavailability experiments.** *ACS Symp. Ser.* 29: 153-154; 1976. (2 references)

Previous investigators had difficulty in accounting for all of the ring- and carbonyl-$^{14}$C-labeled propanil applied to plants. Better accountability was obtained in a method that collected cold trap, $^{14}CO_2$, soil, and plant (chloroform soluble, aqueous soluble, and insoluble) fractions. Most of the $^{14}$C in rice plants harvested from propanil foliar or soil treatments was not extractable. The detection of $^{14}CO_2$, especially on days 3 to 5 after treatment, suggested that the insoluble plant $^{14}$C could be due to incorporation of $^{14}CO_2$ by rice plants into polymeric natural products. The insolubility of most of the propanil rice residue suggested that animal digestibility of the non-extractable residues would be low and thus they should have a negligible toxicologic effect. Experiments with rats revealed low urinary extraction of $^{14}$C from bound propanil residues, and thus indicated minimal metabolism.

**77-1540.** Honeycutt, R. C.; Wargo, J. P.; Adler, I. L. (Rohm and Haas Co. Res. Labs., Spring House, PA 19477). **Bound residues of nitrofen in cereal grain and straw.** *ACS Symp. Ser.* 29: 170-172; 1976.

Only 50% of the radioactive residue in the straw of 110-147 day old wheat and rice plants treated with $^{14}$C-nitrogen could be extracted by conventional organic solvent Soxhlet extraction. Residues bound to lignin and starch were assessed; starch was derivatized to glucosazones. Substantial portions of the (25-33%) residues in rice and wheat straw were present in lignin at harvest in a form not as yet determined. In addition 64-70% of the residues in the grain at harvest were in starch.

**77-1541.** Verloop, A. (Res. Lab., Phillips-Duphar B. V., The Netherlands). **Use of radiotracer studies in the estimation of conjugated and bound metabolites of dichlobenil in field crops.** *ACS Symp. Ser.* 29: 173-177; 1976. (78 references)

The metabolic pathways of some pesticides in plants and animals are partly identical. A common metabolic pathway of pesticides with an atomatic ring structure is hydroxylation followed by conjugation. In animals this serves the function of promoting urinary excretion; in plants the phenol is often bound to the polymeric part of the plant structure. In field trials after soil treatment with $^{14}$C-dichlobenil the main metabolite was 2,6-dichlorobenzamide (BAM), and the second was 3-hydroxy-2,6-dichlorobenzamide (HOBAM). According to radiotracer experiments appreciable amounts of HOBAM were present in apple leaves but not in fruit (detection limit 0.01 ppm) in a gauze-walled greenhouse experiment.

**77-1542.** Haider, K. (Inst. Biochem. Bodens Forschungsanst. Landwirtsch., Braunschweig-Voelkenrode, Germany). **Microbial synthesis of humic materials.** *ACS Symp. Ser.* 29: 244-257; 1976. (78 references)

Studies have shown that the structure of lignin must be essentially altered before it is converted into humic materials. Some fungi are of major importance in this process: the so-called soft rot fungi. Phenolic compounds are formed during decomposition of plant residues. Added plant materials or humic acid exerted little or no influence on the loss of ring, methoxy, or carboxyl and C3-side chain carbons from labeled compounds in experiments, but free hydroxyl group containing phenols were complexed or to linked soil matter and were therefore more resistant to degradation than the methylated compounds. These phenomena could also influence the degradation of pesticide residues, e.g., 2,4-D, in soil.

**77-1543.** Geissbuhler, H. (Agrochem. Div., Ciba-Geigy Ltd., Basel, Switzerland). **Summary of conjugate papers.** *ACS Symp. Ser.* 29: 368-377; 1976. (3 references)

This review of the papers presented on the topic of pesticide conjugation attempted to analyze the diverse presentations and obtain answers to three question areas: typical conjugation reactions of pesticides, status of analytical methodology for pesticide conjugates, and environmental significance of the conjugation reactions. A substantial number of typical conjugation reactions have been recognized to occur with pesticides to date; however, comparison of these findings with those in other fields, e.g., pharmacology, indicates that many additional reactions are yet to be discovered. Conjugation studies in nonmammalian vertebrates, nonvertebrates, and especially microorganisms represent a lack in the current status of knowledge. Great progress has been made in analytical methodology; column chromatography and mass spectrometry are the most widely used tools at present. Standardized and less elaborate procedures must be developed for cleanup and determination of major conjugates on a routine scale. However, some reservations are indicated in pesticide conjugate studies, especially of those which do not contribute substantially to the terminal residues in raw agricultural commodities under practical application conditions.

**77-1544.** Knuesli, E. (Ciba-Geigy Ltd., Agrochem. Div., Basel, Switzerland). **The *s*-triazine herbicides.** *ACS Symp. Ser.* 37: 76-92; 1977.

In a review of the synthesis, properties, and uses of *s*-triazine herbicides, some information was presented on degradation of these compounds. Chemical and biochemical reactions occur at similar sites of the triazine molecule in plants, animals, or soil. Three main pathways and their combinations dominate the degradation process: replacement of the C-2 substituent by a hydroxy group, replacement of the C-2 substituent by properties and amino acids, and reactions of the N-functions. The search for the enzyme for the second reaction type, responsible producing conjugation of chlorotriazines, resulted in the identification of a glutathion *S*-transferase. The first two processes allow resistant plants to transform the phytotoxic triazines rapidly into non-phytotoxic metabolites. In mammals degradation mainly proceeds via conjugation, *N*-dealkylation and side chain oxidation, less by hydrolysis. In soils hydrolysis of the 2-substituents and *N*-dealkylation dominate the transformation of the *s*-triazines.

**77-1545.** Kohn, G. K. (Zoecon Corp., Palo Alto, CA 94304). **The sulfenimide fungicides.** *ACS Symp.*

*Ser.* 37: 153-169; 1977. (28 references)

The discovery, chemical nature, and usefulness of the sulfenimide fungicides are reviewed. The aqueous solubility of sulfenimide fungicides is low, which serves to protect against their appreciable inherent hydrolytic instability. Degradation in biological fluids, which abound with highly active nucleophilic species, is even more rapid than in water. A large number of biochemical interactions of these fungicides has been reported to date. Resistance to the sulfenimide fungicides has not been noted. Sulfenimide fungicides appear to perform a multisite biochemical attack, probably with the sulfhydryl associated enzymes and coenzyme systems. This multisite attack pattern is probably largely responsible for the failure of resistance to develop to the sulfenimide fungicides.

*See also* **77-1392** **77-1406** **77-1446** **77-1559** **77-1560** **77-1561**

**77-1546.** Jenson, S.; Renberg, L.; Reutergardh, L. (Natl. Swed. Environ. Protect. Bd., Wallenberg Lab., S-104 05 Stockholm, Sweden). **Residue analysis of sediment and sewage sludge for organochlorines in the presence of elemental sulfur.** *Anal. Chem.* 49(2): 316-318; 1977. (11 references)

Organochlorines, including PCB and DDT, in sediment and sludge are determined in the presence of elemental sulfur. The method can also be used for unprejudiced search for both volatile and/or polar pollutants. The sulfur interfering in the gas chromatographic determination is removed in a nondestructive treatment of the extract with tetrabutylammonium sulfite. This lipophilic ion pair rapidly converts the sulfur to thiosulfate in an organic phase. The recovery of added organochlorines was above 80% and the detection limit in the range of 1-10 ppb from a 10-g sample. (Author abstract reprinted by permission of the American Chemical Society)

**77-1547.** Thornburg, W. (Del Monte Corp. Res. Ctr., Walnut Creek, CA 94598). **Pesticide residues.** *Anal. Chem.* 49(5): 98R-109R; 1977. (407 references)

A selective review is presented of developments in pesticide methodology between December 1974 and November 1976, taken from papers published in readily available journals. During this time interval new automated instrumentation was introduced, including automated gas chromatographs and computer controlled systems. General references on pesticide nomenclature and methods are first reviewed, followed by sections on gas chromatography, chlorinated pesticides, organophosphorus pesticides, carbamates, herbicides (and dioxin contaminants), fungicides, and miscellaneous.

**77-1548.** Sovocool, G. W.; Lewis, R. G.; Harless, R. L.; Wilson, N. K.; Zehr, R. D. (Health Eff. Res. Lab., Environ. Protect. Ag., Research Triangle Park, NC 27711). **Analysis of technical chlordane by gas chromatography/mass spectrometry.** *Anal. Chem.* 49(6): 734-740; 1977. (36 references)

The composition of technical chlordane has been investigated by combined gas chromatography/mass spectrometry, employing a column commonly used for pesticide residue analysis. Partial or complete structure identifications have been assigned to some 45 individual constituents. Many of these compounds are simple Diels-Alder adducts of cyclopentadiene and hexachlorocyclopentadiene, with further chlorine addition or substitution. Additionally, a series of adducts derived from tetra- and pentachlorocyclopentadiene, followed by further chlorination, had been identified. Several components appear to have incorporated trichloromethyl moieties from the solvent during manufacture. Other compounds with abnormal or rearranged ring fusions have also been recognized and their unusual mass spectra have been studied. (Author abstract reprinted by permission of the American Chemical Society)

**77-1549.** McCully, K. A. (Health Protect. Br., Health Welfare Canada, Ottawa, Ontario, Canada K2P 1B8). **Report on phosphated pesticides.** *J. Assoc. Off. Anal. Chem.* 60(2): 374-377; 1977. (28 references)

A number of reports on methodology for organophosphorus pesticide residues have been published in the past year; some of these reports are reviewed. They included methods for determining azinphosmethyl and dimethoate in apple leaves by flame photometric gas-liquid chromatography following acetate extraction and cleanup by methylene chloride-water and hexane-acetonitrile partitionings, with recoveries of 95-102% for each compound. Carbophenothion residues were determined in goose tissues using chlorfenvinphos as internal standard. Tissues were ground with sand and sodium sulfate, then soxhlet-extracted with ethyl ether. An alumina cleanup column was successively eluted with hexane and ethyl ether. Following mention of many additional specific methods, brief summaries were presented on the Associate Referee topics of confirmation procedures, extraction procedures, general method for chlorinated and phosphated pesticides, sweep codistillation, and thin layer chromatography.

**77-1550.** Freudenthal, R. I.; Emmerling, D. C.; Baron, R. L. (Battelle-Columbus Labs., Columbus, OH 43201). **Separation of rotenoids by high-pressure liquid chromatography.** *J. Chromatogr.* 134(1): 207-209; 1977. (6 references)

A high-pressure liquid chromatography (HPLC) system was developed for complete separation of six rotenoids, using a reversed-phase gradient system. A chromatograph with a UV detector and gradient elution capacity was used. The chromatograph had a Zorbax ODS column (25 cm x 2.1 mm I.D.), particle size 6-10 $\mu$g. The oven temperature was 34° and the column pressure 2000 psi. The six rotenoids tested were separated by gradient elution. The initial solvent composition was methanol-water phosphoric acid (60:39.9:0.1). The final solvent composition was methanol-water phosphoric acid (85:14.9:01.). The gradient rate was 1%/min. The order of resolution was rotenolone, tephrosin, rotenone, deguelin, dehydrorotenone, and dehydrodeguelin. Total separation of the six compounds required about 55 min. This method is practical for industrial quality control. Quantitation is possible.

**77-1551.** Bushway, R.; Hanks, A. (Dep. Agric. Anal. Serv., Texas A & M Univ., College Station, TX 77843). **Determination of rotenone in pesticide formulations and the separation of six rotenoids by reversed-phase high-performance liquid chromatography.** *J. Chromatogr.* 134(1): 210-215; 1977. (5 references)

A new method was developed for high-performance liquid chromatographic (HPLC) separation of rotenoids using reversed-phase chromatography. This method has the advantages of faster analysis, separation of additional rotenoids, and a more stable column. A two-column system was used: a 4 in x 1/8 in O.D. stainless steel precolumn packed with C 18 Corasil followed by a 30 cm x 4 mm I.D. column of especially drilled stainless steel packed with Bonapak. Both columns were maintained at ambient temperature. The absorbance detector was set on 280 nm. Liquid and dust samples of rotenone formulations were examined. The active components of the dusts and the liquid formulations were dissolved in dioxane. Recovery was in the range of 95% overall. Dichlone co-chromatographs with rotenone and absorbs extensively, so an acetonitrile-distilled water system with a flow rate of 1 ml/min should be used in formulations containing it. The six rotenoids were separated in 30 min. As little as 2 ng could be detected.

**77-1552.** Byast, T. H. (Agric. Res. Council, Begbroke Hill, Yarnton, Oxford OX5 1PF, England). **Reversed-phase high-performance liquid chromatography of some common herbicides.** *J. Chromatogr.* 134(1): 216-216; 1977. (4 references)

Residues of herbicides from the triazine, urine, and miscellaneous groups were determined by high-performance liquid chromatography (HPLC) under reversed-phase isocratic conditions with a bonded phase packing in a 0.5 m x 1.7 mm I.D. stainless steel column. From 2.5 to 50% methanol in water has proven satisfactory as eluants. Degradation of phenylureas does not occur during HPLC, so urea herbicides can be separated from some of their metabolites. Work so far was limited to UV-absorbing compounds, since UV absorption detectors are the most sensitive of the readily available detection systems. The detection limits are often comparable to those of GLC.

**77-1553.** Jakovljevic, I. M.; Bishara, R. H.; Kress, T. J. (Lilly Res. Labs., Eli Lilly Co., Indianapolis, IN 46206). **Thin-layer chromatographic separation of several chloro- and methyl-substituted 2-aminopyridines.** *J. Chromatogr.* 134(1): 238-241; 1977. (18 references)

The chromatographic behavior of 2-aminopyridine and 14 related methyl- and chloro-substituted aminopyridines, some of which are usable as pesticides or pesticide intermediates, on silica gel was presented. Samples are dissolved in absolute methanol; samples are spotted onto precoated silica gel plates and developed with chloroform-dioxane (60:40, v/v) for ca. 100 min. The plate is then dried and viewed under short- and long-wavelength UV light. The dried plate may also be exposed to bromine vapors before viewing under UV light, or it may be sprayed lightly with 0.05 *M* aqueous sodium hydroxide followed by 0.5% Fluram in acetone and viewed under long UV light. The aminopyridines quench the fluorescent indicator under short UV light and exhibit a weak blue fluorescence under long UV light. Following exposure to bromine vapors the compounds can be detected at 0.5 $\mu$g. Chromatographic mobility is related to chemical structure.

**77-1554.** Ryan, J. J.; Lawrence, J. F. (Food Res. Div., Bureau Chem. Safety, Health Protect. Br., Tunney's Pasture, Ottawa K1A OL2, Ontario, Canada). **Comparison of electron-capture and electrolytic conductivity detection for the gas-liquid chromatographic analysis of some perfluoro derivatives of four agricultural chemicals.** *J. Chromatogr.* 135(1): 117-122; 1977. (7 references)

The gas chromatographic response of four perfluoro derivatives of four agricultural chemicals [diethylstilbestrol (DES), clopidol, linuron and carbofuran] was examined. The derivatives varied in fluorine content from 3 to 30 atoms per molecule. The sensitivities of the derivatives were found to be *ca.* 10-100 times greater by electron-capture detection than by electrolytic conductivity detection (halogen mode). The sensitivity also was found to increase with increasing fluorine content for all derivatives by electrolytic conductivity, whereas by electron capture, DES and clopidol exhibited similar responses with either the penta-, hepta- or pentadeca-fluoro derivatives. The sensitivity of linuron and carbofuran derivatives by electron capture varied with increasing fluorine content. For detection by electron capture, the heptafluorobutyryl derivatives were preferred for DES and clopidol, and either the heptafluorobutyryl or tivity, the pentadecafluorooctanoyl derivatives were superior for all four compounds. (Author abstract by permission)

**77-1555.** Wong, L. T.; Solomonraj, G.; Thomas, B. T. (Drug Res. Labs., Health Protect. Br., Ottawa, Ontario, K1A OL2, Canada). **Analysis of warfarin in plasma by high-pressure liquid chromatography.** *J. Chromatogr.* 135(1): 149-154; 1977. (8 references)

An improved high-pressure liquid chromatography method for the estimation of warfarin in plasma was developed. Plasma was acidified and

extracted with ethylene dichloride spiked with methylated warfarin [3-(α-acetonylbenzyl)- 4-methoxycoumarin] as internal standard. The residue, redissolved in dioxane, was chromatographed on a reversed-phase column using a mobile phase of 40% dioxane in water (pH 4.2) on a high-pressure liquid chromatograph fitted with an UV absorbance detector. Recoveries from extraction, quantitated using tracer amounts of [$^{14}$C]warfarin and methylated [$^{14}$C]warfarin were 92.2 ± 3.16% and 82.33 ± 1.03%, respectively. The standard curve was linear between 0.625 and 5.0 μg/ml. Detection was sensitive to approximately 0.5 μg/ml and specific without the interference of normal plasma constituents and warfarin metabolites. (Author abstract by permission)

**77-1556.** Sherma, J.; Bloomer, K. (Chem. Dep., Lafayette Coll., Easton, PA 18042). **Separation, detection and densitometric determination of chlorinated insecticides on silica gel and aluminum hydroxide papers.** *J. Chromatogr.* 135(1): 235-240; 1977. (12 references)

Commercial chromatography papers are convenient to use and far less expensive than commercial or hand-prepared TLC plates. Therefore a comparative study was performed using papers vs. plates for separating a mixture of α-BHC, *p,p'*-DDD (TDE), *o,p'*-DDT, aldrin, dieldrin, endrin, and methoxychlor. Papers were dipped in silver nitrate chromogenic solution, dried, and used immediately. After development the spots were revealed by UV exposure, then quantitated by densitometry. Silica gel paper provided better detection than aluminum oxide paper. A 100 ng sample was readily detected on silica gel G layers and silica gel paper, but weakly detectable on aluminum oxide papers. The best separations on all media were obtained with *n*-heptane and 2% acetone in *n*-heptane.

**77-1557.** Scura, V. D.; McClure, V. E. (Scripps Inst. Oceanogr., La Jolla, CA). **Chlorinated hydrocarbons in seawater: analytical method and levels in the Northeastern Pacific.** *Natl. Tech. Inform. Serv.* PB-255, 528, 1974, 11 p.

A method is described for analyzing nanogram quantities of chlorinated hydrocarbons from 1-l samples of seawater. Seawater samples are pumped through a copper column containing a mixture by weight of 5 percent activated carbon powder, 10 percent MgO and 85 percent refined diatomaceous earth. The chlorinated hydrocarbons in the seawater are absorbed or trapped on the column and subsequently eluted with 30 percent benzene in acetone (v/v) for analysis by gas-liquid chromatography. This procedure was used to analyze chlorinated hydrocarbon levels in samples collected off the southern California coast. The authors suggest that anthropogenic chlorinated hydrocarbons can be used for investigation of large-scale ocean currents and mixing processes. (Author abstract by permission)

**77-1558.** Still, G. G.; Norris, F. A.; Iwan, J. (Agric. Res. Serv., Metabolism Radiation Res. Lab., Fargo, ND 58102). **Solubilization of bound residues from 3,4-dichloroaniline-$^{14}$C and propanil-phenyl-$^{14}$C treated rice root tissues.** *ACS Symp. Ser.* 29: 156-165; 1976. (6 references)

Residues remaining in propanil-treated rice roots were investigated following extensive soxhlet extraction with a mixture of acetone:benzene: methanol (1:1:1) followed by boiling in water and extraction with methanol. Hydrochloric, hydrobromic, and perchloric acids each solubilized about 40% of the bound radiocarbon from the insoluble residue. Nitric acid digestion was also informative. The data appear to support the presence of a transient glycoside and the speculation of an *N*-alkylated bound product.

**77-1559.** Wieneke, J. (Radioagron., Kernforschungsanlage Juelich, 517 Juelich, Germany). **Classification and analysis of pesticides bound to plant material.** *ACS Symp. Ser.* 29: 166-169; 1976. (1 reference)

Four weeks after spraying the first trifoliate leaves of bean plants with $^{14}$C-azinphos, 5-11% of the radioactivity was in the bound residue fraction (unextractable with acetone, acetone/water, or chloroform, as well as subsequent Soxhlet extraction with acetone). To determine whether the azinphos-$^{14}$C bound residues represented incorporation of the parent molecule or a fragment of the original insecticide, the unextracted residue fraction was treated by hydrolysis with 25% formic acid and dissolution of cellulose. Following this procedure radioactive material was distributed in the cationic, anionic and neutral fractions, in the cellulose fraction and also in the fraction corresponding to lignin. The radioactivity did not correspond to the parent compound or a major portion thereof. When a chromatography column was filled with the unextractable residue fraction and successively eluted with various solvents more than 80% of the radiolabel was extracted, primarily by systems containing methanol, butanol, and acetone.

**77-1560.** Bandal, S. K.; Clark, H. B.; Hewitt, J. T. (3M Co., 3M Ctr., St. Paul, MN 55101). **Chemical extraction of certain trifluoromethanesulfonanilide pesticides and related compounds from soil.** *ACS Symp. Ser.* 29: 285-300; 1976. (6 references)

The degradation of new herbicides of the *N*-aryl 1,1,1-trifluoromethanesulfonamide class in a sandy loam soil was examined. After incubation for the desired time period (up to 2 mo) soil samples were soaked with distilled water, then soxhlet-extracted for 16 hr with an acetonitrile-water azeotrope. After solvent extraction the extracts were examined by TLC and radioautography. For TLC a variety of solvent systems were used in the two-dimensional mode. The compounds that contained sulfate groups were found to have reacted very little with soil while a perfluidone related compound lacking the sulfate group volatilized extensively. When soil organic matter was fractionated into humic acid, fulvic acid, and humin fractions the amount of radiocarbon in the humic acid decreased with time, with a concomitant increase in the amount of radiocarbon associated with the fulvic acid fraction. The acetamide group appears to be important for binding to soil particles.

**77-1561.** Hill, I. R. (ICI Plant Protect. Div., Jealott's Hill Res. Stn., Bracknell, Berks., England). **Degradation of the insecticide pirimicarb in soil -- characterization of "bound" residues.** *ACS Symp. Ser.* 29: 358-361; 1976.

The degradation of pirimicarb was studied in sterile and nonsterile soils under controlled laboratory conditions. Pirimicarb and degradation products were extracted directly from the moist soil after incubation by refluxing in acetone:water (5:1). Chromatographic analyses of these extracts indicated that pirimicarb degradation proceeded via cleavage of the carbamate moiety from the ring, *N*-dealkylation of the 2-dimethylamino group, and pyrimidine ring cleavage. Radioactivity remaining after exhaustive extraction was considered to be "bound". Within an incubation period of 1 year approximately 20-60% of the applied ring-$^{14}C$ became bound in various soil types. Attempts were made to remove and characterize the bound pesticide residues in extracted freeze-dried soils. Extractions were carried out with acetone:water (5:1), acid, alkali, and salt solutions by shaking, refluxing, and ultrasonication. Air was passed through the extraction vessels, then through tubes containing in succession methoxyethanol and ethanolamine or 0.5 *M* sodium hydroxide. Either air drying or freeze drying soil samples enabled further amounts of radioactivity to be extracted by repeated acetone:water reflux. Amounts of materials extracted and trapped in the different tubes gave information on their probable chemical forms in soil.

**77-1562.** Takano, T. (Tech. Div., Japan Insectivide Industrial Assoc., Uji, Kyoto Pref., Japan). [**Analysis of optically active allethrin in mosquito coils.**] *Bochu Kagaku (Sci. Pest Contr.)* 42(1): 40-45; 1977. (3 references) (Japanese)

The content of optically active allethrin (3-allyl-2- methylcyclopent-2- en-4-on-1-yl *d-cis,trans*-chrysanthemate) in commercial mosquito coils was determined by gas chromatography, as was the content of its geometric and optical isomers. The method was the same as that for allethrin, consisting of extracting the optical isomer from the coil with methanol, then cleaning up by TLC (silica gel), hydrolyzing to obtain chrysanthemic acid, derivatizing the diastereoisomeric esters of d-z-octane, and separating the *d-trans-*, *l-trans-*, *d-cis-* and *l-cis-* esters by gas chromatography. The isomer composition was determined by the ratio of peak areas. The total content of *d-cis,trans*-allethrin was 93.3% on the average. The content of *d*-isomers in allethrin was 97.8%. When the results of 1974 were compared with those of 1975 (stored specimens), almost no difference was found, indicating negligible change of the active ingredient during one year of storage.

**77-1563.** Takeda, M.; Sekita, H.; Uchiyama, M. (Nat. Inst. Hyg. Sci., Setagaya-ku, Tokyo, Japan). **Studies on analysis of pesticide residues in foods. XXI. Analytical method for captan and captafol in agricultural crops.** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 18(1): 20-25; 1977. (5 references)

The ECD-gas chromatographic method for captan and captafol residues in agricultural crops contaminated with organochlorine insecticides was studied and improved. The organochlorine compounds, e.g., BHC isomers, *p,p'*-DDT and its analogs, and chlorinated cyclodiene compounds are still present in most agricultural crops in Japan. The use of florisil column chromatography permitted separation of insecticides and fungicides by eluting the insecticides from the column with 15% ether in hexane and 30% ethyl acetate in hexane. The fungicide eluate was then cleaned up by activated charcoal column chromatography with 50% ether in hexane. Prior to florisil column chromatography removal of oily materials was required by partitioning between acetonitrile and hexane for summer oranges (peels), dried string beans, and wheat. The limits of detection were 0.005-0.63 $\mu$g for captan and 0.02-2.0 $\mu$g for captafol. The recoveries of captan and captafol added to agricultural crops were 72.2-90.6% and 79.5-95.0% respectively.

**77-1564.** Ito, Y.; Toyada, M.; Iwaida, M. (Osaka Br. Nat. Inst. Hyg. Sci., Higashiku, Osaka, Japan). [**Application of gas chromatography with FPD for the determination of methyl thiophanate, its metabolites and mono-*sec*-butylamine.**] *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 18(1): 26-32; 1977. (17 references) (Japanese)

A method for FPD-gas chromatographic de-

ermination of methyl thiophanate and its metabolites in plants (mono-*sec*-butylamine and methyl benzimidazole carbamate or carbendazim) after derivatizing to their benzenesulfonates was established. Methyl thiophanate and its metabolites in vegetables and fruits were extracted with ethyl acetate, separated from interfering materials by alumina column chromatography and then benzene-sulfonated. The recoveries of methyl thiophanate, methyl benzimidazole carbamate, 2-aminobenzimidazole and mono-sec-butylamine added to vegetables and fruits were about 90% when added at 0.5 ppm and 80-85% when added at 0.1%. The sensitivity of detection was 0.01 ppm for mono-*sec*-butylamine, 0.02 ppm for aminobenzimidazole and methyl benzimidazole carbamate and 0.04 ppm for methyl thiophanate.

**77-1565.** Uno, M.; Ueda, E.; Okada, T.; Onji, Y. (Nara Pref. Inst. Publ. Health, Nara, Japan). [**Studies on residual decomposition products of pesticides in agricultural products (1). Residues of ethylenethiourea (2-imidazolidinethione) in agricultural products.**] *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 18(1): 53-56; 1977. (14 references) (Japanese)

By employing an improved version of the method of Newsome, residual amounts of ethylen-*bis*-dithiocarbamate and its degradation product, ethylenethiourea, in/on 16 agricultural crops such as strawberry, melon, grape, peach, pear, chinese citron, grapefruit, tomato, cucumber, apple, spinach, redbean, soybean, cabbage, onion, and welsh onion was made available. On 3 (2 strawberries and one cucumber) out of 59 analyzed specimens, ethylenethiourea was found in the range of 0.008-0.076 ppm. The parent pesticide residue, ethylene bisdithiocarbamate, was found on one specimen of strawberry, spinach and cucumber each in the range of 0.34 - 1.21 ppm. It was not clear whether ethylenethiourea was formed in the formulation process or after application to crops.

**77-1566.** Fukuhara, K.; Takeda, M.; Uchiyama, M. (Japan Food Drug Safety Res. Ctr., Hatano, Kanagawa, Japan). [**Studies on analysis of pesticide residues in foods XXV. Analytical method for endosulfan in crops.**] *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 18(2): 149-153; 1977. (11 references) (Japanese)

The method of simultaneously determining $\alpha$- and $\beta$-endosulfan and endosulfan sulfate in the presence of other organochlorine insecticides was established. Cleanup was carried out by eluting the activated charcoal-Florisil column with a mixture of hexane and benzene (2:3) for alpha-endosulfan and organochlorine pesticides, and with a mixture of hexane and ether (1:1) for beta-endosulfan and endosulfan sulfate. The separation of *p,p'*-DDE and alpha-endosulfan was successful with 5% OV-1, 2% DEGS plus 0.5% phosphoric acid, and 1% QF-1. The separation of beta-endosulfan and endosulfan sulfate from chlorobenzilate, chloropropylate, phenisobromolate, and tetradifon was successful using 1.5% SE-30, 5% OV-17, and 5% XE-60 respectively. After trial recovery experiments on 7 crops such as satsuma orange, plum, watermelon, cucumber, tomato, lettuce and tea leaves it was found that the method could be applied to determine endosulfan derivatives with recovery percentages between 82.7 and 91.7%.

**77-1567.** Isshiki, K.; Tsumura, S.; Watanabe, T. (Kitakyushu Munic. Inst. Environ. Health Sci., Tobato, Kitakyushu, Fukuoka, Japan). [**Analytical method for piperonyl butoxide in agricultural products II. Determination by high speed liquid chromatography.**] *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 18(2): 159-163; 1977. (5 references) (Japanese)

The method of determining piperonyl butoxide in crops by high speed liquid chromatography was studied, and the following results obtained. It was possible to execute the determination using either fluorescence detector or ultraviolet detector; the limits of determination were 10 and 1 $\mu$g of piperonyl butoxide per ml respectively with these two detectors. Piperonyl butoxide in the specimen was cleaned up by partitioning between *n*-hexane and acetonitrile for the fluorescence detector; however, cleanup on an activated charcoal column was additionally necessary for the ultraviolet detector. In recovery experiments on 9 kinds of grain crops such as unhulled rice, hulled rice, wheat, buckwheat, barley, oats, rye, corn, and millet, the recovery percentages were between 79.8 and 102%.

**77-1568.** Pribyl, J.; Herzel, F. (Inst. Wasser- Boden-Lufthyg., Bundesgesundheitsamt, D-1000 Berlin 33, Germany). **Fluessig-chromatographische Bestimmung von Chloranilinen. [Determination of chloroanilines by liquid chromatography.]** *Fresenius Z. Anal. Chem.* 283(5): 343-347; 1977. (23 references) (German)

The separation of chlorine-substituted anilines is described which, if performed by gas chromatography without conversion, will become problematical. Parameters are presented which appear to be optimal for routine analysis by liquid chromatography in silica gel columns. To ensure a full utilization of the photometer detector, the UV spectra were recorded. (Author abstract by permission)

**77-1569.** Sachse, J. (Eidgenoss. Forschungsanst. Landwirtschaft Pflanzenbau, Zurich-Reckenholz, CH-8046 Zurich, Switzerland). **Ueber die Bestimmung von Chlorchlorinchlorid (CCC) in Getreide. [Determination of chlorocholine chloride (CCC) in cereals.]** *Z. Lebensm.-Unters.-Forsch.* 163(4): 274-277; 1977. (13 references) (German)

Samples of spring wheat and oat grains and straw were extracted with ethanol for determination of CCC (chlormequat chloride) residues. The extracts were cleaned up by ion exchange and alumina column chromatography and TLC. The CCC was localized on the TLC plate by means of the *Rf* and a color reaction, then quantitatively estimated by a colorimetric method with dipcrylamine. The recovery was 98 ± 5% for wheat grains and 80 ± 5% for oat grains. The detection limit was 0.1 ppm. The amounts of CCC in wheat grains were 0.3-0.7 ppm, in wheat straw 1-7 ppm, and in oat grains 0.9-3.4 ppm dry matter. CCC could not be detected in oat straw with this method.

*See also* **77-1502**

**77-1570.** Polzhofer, K. (NATEC, Gesellsch. Naturwissenschaftl.-Tech-Dienst mbH, D-2000 Hamburg 50, Germany). **Determination of benomyl, carbendazim and 2-aminobenzimidazole (2-AB) in plant materials. Part I: apples, red-currants, grapes, kale and sugar beets.** *Z. Lebensm.-Unters.-Forsch.* 163(2): 109-110; 1977. (5 references) (English)

Benomyl and carbendazim are widely used systemic fungicides; German tolerance limits for these compounds are between 0.1 and 7 ppm. A method was developed for determining benomyl and carbendazim in apples, red currants, grapes, kale, and sugar beets. Benomyl and carbandazim are extracted with ethyl acetate, saponified with sodium hydroxide, and determined as 2-aminobenzimidazole by TLC after extraction. The TLC developing solvent is chloroform/methanol/ammonia (75:25:1), and for detection it is scanned with a chromatogram spectophotometer at 273 or 280 nm. The limits of detection are 0.02-0.08 ppm and recoveries about 87% at the 0.5 ppm level.

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